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ABSTRACT

This report is designed to help the educational community develop the "all aspects of the industry" (AAI) strategy promoted in the Perkins Vocational Education Act. The introduction describes the current status of AAI and elaborates on three arguments for it: (1) AAI is a pedagogic strategy that promotes more effective learning; (2) better prepares students for varied and changing roles; and (3) is employment preparation for the restructured workplace. Section 2 provides background information on graphic communications industries. It identifies three broad reasons why firms have not moved faster towards an innovative production organization or the broader training that might accompany it: (1) issues having to do with the labor supply, educational programs, and institutions that serve the industry; (2) the day-to-day demands of production; and (3) the threat to traditional divisions and categories. Section 3 illustrates how these three factors interact in a case study of printing schools. Section 4 describes a school that has successfully transformed its strong graphic arts program. Section 5 provides background on the apparel industry and discusses two educational programs for production workers. Section 6 focuses on training for nonproduction jobs and provides a case study of two growing and successful associate degree programs that train fashion designers and merchandisers. The final section summarizes findings and suggests policy directions with an emphasis on overcoming barriers to the spread of AAI. Contains 37 references. (YLB)

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EDUCATION FOR ALL ASPECTS OF THE INDUSTRY: OVERCOMING BARRIERS TO BROAD-BASED TRAINING

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INTRODUCTION

Education reform has taken a new turn. Just a decade ago, *A Nation at Risk* signaled the preoccupation with traditional academic curricula, touching off a widespread movement to strengthen academic course requirements for secondary schools. The mid-1980s saw the spread of the educational restructuring movement. Taking inspiration from innovations in workplace design, educators developed team-based and decentralizing strategies such as site-based management and school-oriented total quality management (TQM).

While the restructuring efforts continue, reformers have increasingly sought ways to strengthen the links between schools and workplaces through curricular and pedagogical innovation as well as through increasing the emphasis on the educational value of actual experience on the job. One indication of the shift in focus is the role in the current education reform discussion of the Carl D. Perkins Vocational and Applied Technology Education Act of 1990 (Perkins II). This act consisted of amendments to previous Perkins legislation, which served as an impetus for federal involvement in vocational education. Throughout the 1970s and 1980s, vocational education was increasingly viewed as an anachronistic and inferior educational strategy. Thus, while Perkins legislation was never central to education reform, its significance seemed to fade even more during the 1980s. In the 1990s, however, Perkins legislation is very much at the center of the education reform discussion. Strategies and practices emphasized by the Perkins II such as integrating vocational and academic education, Tech Prep, and enhanced skill certification have all been emphasized by the Clinton administration, as well as educational strategies that are designed to place students in learning experiences on the job such as apprenticeships and cooperative education. It is an indication of the significance of the shift in focus that these strategies would have seemed foreign or even misguided to the authors of *A Nation at Risk*.

This shift in focus has emerged from a growing conviction that there is a chasm between students' experiences in school and their future experiences in the workplace and in other nonschool environments. While schools and workplaces have always been different, many reformers believe that recent changes in the economy and the nature of work have significantly intensified the problem.

This disparity between school and work has several unfortunate consequences. For many students, schools fail to prepare them adequately for future roles. According to this perspective, many young people fail to acquire the skills needed in the modern economy and workplace, which weakens the competitiveness of the country's economy and threatens its standard of living. The disconnection between schooling and postschool experiences also robs schooling of meaning, failing to provide strong motivation for learning. Cognitive scientists have also concluded that learning is more effective when it is embedded in the use to which that learning will be put.

Thus, education that is connected more directly to postschool activities is believed to be more effective pedagogically and better prepares students for a faster changing world and workplace. Certainly one way to connect learning to the outside world is to actually conduct some of that learning in the workplace, as in apprenticeships or cooperative education. Another approach is to attempt to reform the schools themselves so that students gain experiences that more closely reflect broader activities.

This study looks at one educational reform strategy called for by Perkins II and designed to broaden student experiences. In outlining the guidelines for program funding under the legislation, Perkins II says that vocational education programs should be evaluated according to their capability to provide vocational education students with "strong experience in and understanding for *all aspects of the industry* [emphasis added] the students are preparing to enter (including planning, management, finances, technical and production skills, underlying principles of technology, labor and community issues, and environmental issues)" (Section 113(a)(3)(B)).

Typically, programs that emphasize all aspects of the industry (AAI) start from traditional vocational skills and develop an educational program that explores the context in which those skills are used. Thus, carpentry is taught as part of a broader housing or "built environment" program, and auto mechanics is taught as part of a transportation program. In addition to vocational skills needed for a particular occupation, students are taught the history of the industry and general technological principals important to it. Generally, an effort is made to get students to understand basic aspects of the other occupations in the industry. There is also an emphasis on planning, project development, teamwork, communications, and other generic social and work-related skills. This approach seeks to connect traditional vocational skills to broader knowledge and competence associated with the context in which those traditional skills are used.

The AAI approach has three broad justifications. The first is pedagogic: integrating vocational education with instruction about the context in which graduates will work is a superior pedagogic approach and promotes more effective learning. AAI is a different method of teaching vocational and academic skills. Rather than splitting learning up into the traditional vocational and academic subjects, AAI covers related material through integrated projects that include social studies, math, English, and science competencies as well as what are usually considered vocational skills.

A second justification for AAI is that given changes in the macroeconomy that effect the types of careers young people can expect to have, those young people need broad skills that will prepare them to do a variety of jobs. According to this perspective, long-term employment with one firm is increasingly unlikely. Fast-changing technology also forces students to be prepared to undergo significant changes in their work over the course of their careers. Many workers who have lost jobs in large firms as a result of corporate restructuring have tried to develop their own businesses, and AAI advocates argue that the strategy is particularly effective in giving students the background needed for entrepreneurial activities.

The third argument for AAI also involves the nature of the changing economy, but while the previous argument focused on the needs of employees in a volatile marketplace, this one emphasizes the interests of the employers and their changing demand for higher skilled workers—students educated in AAI will be increasingly more effective employees given the particular evolution of the nature and organization of work. Thus, an AAI approach will both serve the learning needs of students and the particular evolving needs of their future employers.

Outline and Research Framework

The purpose of this report is to help the educational community develop the AAI strategy. Although we focus on this one particular approach, the analysis has a wider significance. AAI is representative of the central thrust of education reform during the early

1990s. AAI emphasizes combining learning and experience, integrating vocational and academic education, breaking out of traditional disciplinary boundaries, forging links between schools and other institutions, avoiding narrow training, and preparing students for a variety of activities and a faster-changing environment. These are all central issues in the broad discussion of education reform. Thus, there are lessons in the experience reported here for a broad range of educational initiatives.

The emphasis on AAI in Perkins II has generated a growing volume of discussion about the strategy, but our report examines AAI from a unique perspective. Although the specific model outlined by Perkins II is too new to have been systematically evaluated, much of the discussion so far has focused on the pedagogic advantages of the strategy or its advantages for students' abilities to make their way in an increasingly fluid labor market—that is, on the first and second broad justifications discussed above. In contrast, our report looks at how the spread of AAI relates to the perception that there is an increasing demand by employers for workers with AAI-type education, knowledge, and skills. Thus, we look at AAI primarily from the perspective of the workplace, focusing on the interaction of programs that follow the strategy and the industries that employ their graduates.

Four broad questions underlie our investigation:

1. How strong is the demand for AAI knowledge and skills in the workplace?

2. To what extent is AAI reflected in the curricula and educational strategies of the schools and training programs (including training offered by employers) that prepare students for the workplace?

3. What are the barriers that stand in the way of wider development and diffusion of AAI strategies in schools?

4. What additional public policy and research can help educators and employers overcome the barriers to AAI?

By understanding the barriers that thwart the spread of AAI and other approaches that share many of its characteristics, we hope to help educators and employers overcome those problems.

Outline

In the rest of this introduction, we first describe the current status of AAI and elaborate on the three previously mentioned arguments for the strategy. The remainder of the report is in three sections. Two of those sections are (1) case studies of two industries—apparel and printing—and (2) educational and training strategies that serve those industries. In each section, we evaluate the extent to which employers are implementing production systems that call for broader knowledge of the industry and of the context in which work takes place. In the subsequent sections, we examine several educational programs designed explicitly to serve those industries, assessing the extent to which they have implemented an AAI strategy and emphasizing the barriers that stand in the way of the approach. The final section of the report summarizes our findings and suggests policy directions with an emphasis on overcoming barriers to the spread of AAI.

We chose the printing and apparel industries because in both cases, technological and market changes have created situations that appear to create advantages to broader knowledge. Not only have there been changes internal to the respective production processes that appear to favor broader knowledge of the industry, but significant changes in the relations between producers and their customers have blurred previously accepted distinctions. For example, in printing, desktop publishing and digital printing processes have the potential to transform the internal occupational structure within the industry and significantly blur existing market segmentation. Perhaps more remarkable, the new technologies have the potential to obscure the distinction between printers and their customers. In effect, printers must now compete with their customers. In the apparel industry, various market changes have promoted more interactive relationships between apparel producers and retailers, with possible implications for the nature of the jobs of workers within each of those sectors. All of this suggests that an AAI approach would be advantageous for workers in both industries.

Because we look at this issue from the point of view of the workplace, we have chosen educational systems that are designed to prepare students to enter the workforce directly (or perhaps to train them after they are already in the workforce). For the most part, these are postsecondary institutions. Furthermore, these schools are not explicitly part of the recent Perkins-encouraged efforts to promote AAI. They have been schools and programs designed to focus on the needs of the two industries that we are studying. They include the printing apprenticeship program organized by the Graphic Communications

International Union School, the Don Bosco Technical Institute (offering high school and associate's degrees in printing or graphic arts), the fashion/apparel program at Los Angeles Trade and Technical College, the apparel education programs associated with North Carolina State University (called TC^2) and EL Paso Community College, and the New York Fashion Institute of Technology. Because of their long-standing ties to the industries that they serve, if broader, more industry-oriented education is called for by the industries, it is likely that there would be particular pressure on these schools to move in that direction. But at the same time, the schools are often focused on turning out students with specific, narrowly-defined skills who can go to work immediately. As a result, the schools might be less willing to give up instruction time for immediately useful skills in order to present classes in broader aspects of the industry that might only be useful in the long run or in more intangible ways in their jobs. Thus, the sites that we have chosen offer an opportunity to observe the common tension between the perception that industry wants broader skills and the more immediate exigencies of the job market.

The Current Status of AAI Education

From one point of view, education for AAI is new. It has only been since 1990 that Perkins II has encouraged all aspects of the industry education within the vocational education system. Thus, the approach can hardly be expected to have spread very far. Certainly, advocates of AAI have worked hard to develop models of the approach and have mounted some programs based explicitly on the AAI notion.

For example, the Center for Law and Education (1991b) has been directly involved in several projects to develop the model in secondary schools. One of their most advanced models is in Cambridge, where vocational education students participate in a comprehensive program built around the study of the city of Cambridge. Through studying and modeling the city using a variety of approaches and media, students learn academic skills such as math and writing in addition to skills taught in traditional vocational programs. There is heavy emphasis on group projects and teamwork, as the following example shows:

> The outcome of the ninth grade program will be that students will have developed and used a variety of broad work and life skills, including working in teams, writing, speaking, designing and conducting research,

> planning and managing long-term projects to create high quality products, and identifying and drawing on resources. (p. 8)

The Center for Law and Education has also begun working with Chicago schools to develop the AAI strategy. With the assistance of the center, The Youth Enterprise Network (YEN) was formed and began working on reform in three inner city vocational high schools. The Center also organized a conference during the summer of 1992 to develop and spread the strategy. Given the encouragement provided by Perkins II, it seems likely that the AAI strategy will continue to spread.

But the notion of an integrated industry-oriented curriculum did not originate with Perkins II. A broadening of the vocational curriculum from traditional trade skills to larger definitions—from carpentry to "built environment"—has been slowly spreading for several years.

Some textbooks have reflected a trend towards AAI. For example, a 1985 book titled *Exploring Production* (Wright & Henak, 1985) was used in Chicago public schools. The book followed the production process from an exploration of the raw materials, to the topic of engineering materials, to actual production and construction and included material on financial controls and construction bidding. Also, the classes in which the book was used often built structures with plumbing and electricity in the classroom. Indeed, a student following this textbook would be exposed to all aspects of the industry,[1] although they may not necessarily have experienced the full AAI model as outlined in Perkins, including obtaining "strong experience in" such areas as "labor and community issues, and environmental issues."

Even before the recent interest in reform of vocational education, there have been a variety of schools, both at the secondary and the postsecondary levels that have been organized around particular industries. These schools were often located in areas in which the industry was concentrated—printing in New York and other large cities; health in many urban areas; and apparel and textiles in New York, Los Angeles, and the southeast. To be sure, these schools often continued to emphasize the preparation of students for particular occupations within the industries with perhaps a general survey course for entering students which focused on providing some background in the broader aspects of the relevant industry. But because of their close ties with the associated industries, they were more likely than general vocational schools or community colleges to be in touch with particular industry needs.

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[1] The breadth of the course is illustrated by the chapter headings: engineering materials, primary and secondary manufacturing processes, establishing a manufacturing enterprise, designing and engineering products, developing manufacturing systems, manufacturing the product, marketing the product, performing financial analysis, preparing for the construction project, designing and planning the project, managing construction activities, building the structure, installing the systems, finishing the project, closing the contract, and production and society.

Three Justifications for AAI

As mentioned previously, there are three separate but closely related arguments for an AAI approach. According to the first, AAI is a pedagogic strategy that promotes more effective learning. The second is based on the contention that AAI will better prepare students to manage increasingly heterogeneous careers in a faster-changing economy and society. And the third suggests that given current changes in the economy and the nature of work, the AAI approach will do a better job than traditional vocational education strategies in preparing students for work. Each of these arguments will be developed below.

AAI as a Pedagogic Strategy

Since the mid-1980s, an increasingly influential stream of research has developed the argument that there is a wide gap between the skills learned in the classroom and those used on the job. At best, students learn the skills they need to perform well in school, but those skills may not serve them well outside of school—learning in school is not "transferred" to the community and workplace (Raizen, 1989; Resnick, 1987). The emphasis on integrating vocational and academic education is one approach to bringing together the worlds of work and school. The "contextual learning" movement in basic skills education is based on the notion that individuals learn basic skills more effectively if they are taught in close relationship to their everyday activities (Sticht, 1989). "Cognitive apprenticeship" is also a pedagogic technique that can be used in the classroom but that is designed to create a learning environment that reproduces the technological, social, and motivational characteristics of the real world situations in which what is being learned will be used (Berryman & Bailey, 1992; Collins, Brown, & Newman, 1989). Thus, schooling as it is currently organized and administered is seen as artificial or inauthentic, failing to teach students many of the social and intellectual skills that they will use both on the job and in their everyday lives.

By actually incorporating education into real world situations (albeit often by simulated experiences), a strategy based on teaching AAI has the potential to bridge this intellectual or cognitive gap between school and work (or more broadly social activity in general). This is a much broader justification for work-based education than the argument traditionally advanced by advocates of vocational education that academic schooling does not teach "useful" or "marketable" skills. These newer arguments suggest that traditional schooling (academic as well as vocational) prevents the full development of each student's cognitive abilities. Thus, from this point of view, appropriately organized and structured work-related education is not simply a good way to teach the noncollege-bound student high quality vocational skills, but it is a valuable educational strategy for the intellectual development of a wide range of students.

AAI Better Prepares Students for Varied and Changing Roles

In addition to these general cognitive benefits, there are a variety of benefits for students exposed to AAI. For example, the Center for Law and Education, which was instrumental in getting the AAI language into Perkins II, argues that the broader knowledge implied by AAI promotes the career development and employability of young people. Students prepared for only one occupation have much less flexibility in the labor market. And flexibility is becoming increasingly important as corporate restructuring, downsizing, the decline of unionism, and other factors appear to have reduced the amount of time that young people can expect to work for one employer.

The Center for Law and Education (1991a) also points out that broader training better prepares students for changing technology and in general produces students who can contribute more to their communities. Thus, they argue,

> if programs prepare students only to fill the current job openings in low-income communities, they are left passively dependent upon too few jobs, which demand too few skills and provide too little income for a decent life. In contrast, students who understand and have experience with planning, management, labor and community issues, etc., can survive, thrive, and help others in low-income communities. They can help develop institutions which address unmet social and economic needs through better use of people's underutilized potential. (pp. 3-4)

AAI advocates such as Senator Edward Kennedy have also suggested that the strategy can help prepare students for entrepreneurial activities. With less chance of secure, long-term employment, many ex-employees are looking for alternative sources of income and learning about "planning, management, finances, . . . [and] labor and community issues" in addition to technical and production skills that will be useful for those who try to set up their own businesses.

All of these arguments suggest that students are better off if they have broad knowledge and experience. Moreover, for the most part, the arguments make sense regardless of the condition of the economy. It is worthwhile promoting more effective learning and giving students more flexibility in the labor market in any type of economic conditions. But AAI has also been promoted as a strategy that is particularly effective given emerging changes in the nature of work.

AAI as Employment Preparation for the Restructured Workplace

Anxiety about lagging productivity and international competition has played a large role in maintaining interest in educational reform. Interest in improving education in the abstract has never sustained the impulse for educational reform. Sputnik prompted some curriculum reforms, but the driving force in educational reform during the 1960s and 1970s was a concern about access and equity. This motivation was superseded in the 1980s and 1990s by a widespread belief that weakness in the nation's education system was a central cause of a variety of economic problems.

The central idea that underlies much of the thinking about the contemporary relationship between education and productivity is that the U.S. education system was appropriate for the technology and production processes of the past. The intensification of national and international competition, the proliferation of products, the faster pace of change, and the growing level of uncertainty have forced American businesses to look for new ways of organizing their production processes. These organizational changes in turn lead to shifts in the nature of work and the skills and educational background needed to operate effectively. According to this perspective, the U.S. education system does not serve the needs of this emerging work environment. Thus, educators, policymakers, and representatives of business have urged a variety of reforms to bring the educational system back into line with the society and economy in which it is located. An emphasis on providing education and training in AAI is increasingly prominent among that list of proposed reforms.

Determining the Demand for Workers with Broader Skills

During the last few years, the discussion about changing skill requirements has come to focus on changes in the way that production is organized. In the past, analysts asked whether modern technology affected skill requirements, but many concluded that the skill effects of technology were determined not by the technology itself but rather by the way that the technology was used (Bailey, 1990). Employers could organize work in order to minimize skills (deskill) or in ways that required more broadly skilled workers (see, for example, *America's Choice: High Skills or Low Wages!* [National Center on Education and the Economy, 1990]).

This discussion will now focus on two broad strategies for organizing work. One is referred to as the traditional or mass production strategy and the other is often called the transformed model.

U.S. business rose to power during the early and middle decades of the twentieth century on the basis of a production system designed to drive down the unit cost of standardized products produced in large numbers. This traditional production system

> emphasizes narrowly defined jobs that can be filled by interchangeable, low-skilled workers; large inventory buffers that minimize the disruption caused by production errors or poor quality parts; extra employees to cope with higher absenteeism; sophisticated quality control inspection systems and specialized personnel to catch defects after production is completed; and technologies designed to minimize the number of workers and to control or limit worker discretion. (Thomas & Kochan, 1990, pp. 19-20)

This system had many advantages. It reduced the unit costs and training needs and insulated the firm's production process from turnover and absenteeism. But while the system allowed firms to operate with lower-skilled workers, this benefit was bought at a cost. Technology had to be specially designed to minimize worker control and limit worker discretion. Front-line production workers were expected to handle only routine problems, requiring many supervisors, managers, and support personnel to deal with any change in procedure or unexpected difficulties. In effect, employers made a tradeoff between low skill levels and high levels of detailed planning, close supervision, and managerial effort.

The traditional system is most advantageous when products or services and production system and technologies rarely change. When change is infrequent, the cost of developing the specialized equipment and processes required to routinize tasks can be recouped over the long period in which tasks do not change. A stable environment also minimizes the number of unexpected problems that low-skilled workers would not be able to handle.

During most of the postwar era, the advantages firms derived from being able to use a low-skilled workforce outweighed the costs associated with using this traditional system. Standardization and mass production were the goals of both manufacturing and large service providers such as insurance companies and banks.

But recent economic developments—especially the acceleration of change—challenge the viability of the traditional system, which is so dependent on predictability. Flexibility, fast response time, and innovation, as much as cost, are now considered the keys to growth and competitiveness. Constant change prevents the routinization of production technologies or processes. Managers can still keep down skills, but they will have to make a much larger investment in designing work aids and helping unskilled workers cope with a growing number of unpredictable problems.

Rather than the low-skill, high control system characteristic of mass production, the new economic environment appears to favor the integration of traditionally separate functional roles (design, engineering, marketing, manufacturing, and so forth), flatter organizational hierarchies, decentralization of responsibility, and greater employee involvement. While the traditional system has advantages in terms of control and reduced training and skill needs, the transformed system is more responsive and flexible and more conducive to continuous innovation. In effect, by making lower-level workers more flexible and skilled and by giving them more responsibility and discretion, their jobs incorporate some of the supervisory, planning, repair, maintenance, and support functions that were previously reserved for managers and specialists. This type system is therefore based on much less direct supervision, but requires workers with higher skills.

A workforce with broader skills and knowledge, including an understanding of AAI, has many advantages in this type of transformed production organization. But the needs of flexibility, quality, and speed have profound implications for the relationships among firms in the overall supply line for a product as well. These changes in the relationships among firms appear to be even more important than changes in the internal organization of firms in increasing the importance of AAI.

Changes in the economy favor producers able to turn out a variety of goods quickly, without large inventories of supplies. But in order to do that, the producer's suppliers must also be able to deliver high quality inputs just as quickly, whether they are manufactured items or services. One solution to this problem is the development of networks or partnerships among firms in the supply chain. Smaller firms in the supply chain work out partnership arrangements with customer and supplier firms in which they share information on market demand and innovations and coordinate their production rather than maintaining arms-length, market-mediated relationships.[2] A key to this strategy is close cooperation among the firms within the network. If this is successful, each firm can enjoy the advantages of a coordinated and responsive supply pipeline while concentrating on its function within that process. The development of this type of productive interaction among firms requires that workers in those firms have a stronger understanding of the functions and problems of the other firms with which they are interacting—precisely the type of understanding that an education oriented towards teaching AAI can provide.

Although there is considerable evidence for the economic advantages of the transformed internal organization or the more interactive relationships to suppliers, there continues to be controversy about the extent to which these strategies have been adopted (Bailey, 1992). One of the objectives of this report is to evaluate the shift towards innovative work organization in the industries that we are studying and to assess the extent to which either education reform might promote new types of work organization or be slowed down by a perception on the part of educators that firms do not want these new types of skills.

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[2] See Jacquemin (1988), pp. 150-151. Of course, it is possible to develop close relationships with contractors without actually arranging them. For a discussion of this development, see Johnston and Lawrence (1988).

THE PRINTING INDUSTRY

Introduction

The commercial printing and newspaper publishing industries are being transformed by persistent and often dramatic technological and market changes. Advances in electronics, computers, chemistry, and paper manufacture, as well as a greater understanding of environmental risks in manufacturing continue to alter the printing process. Equally decisive are market shifts caused by new forms of document creation, changes in the perceived need for information, demographic and lifestyle changes, and alternatives to paper as the print display medium.

In response to these transformations, the industry's educational institutions, union training directors, business leaders, training departments, and professional associations argue that economic survival requires aggressive development and adoption not only of new technology but also of new forms of work organization. Many industry leaders and representatives claim that these technological and organizational responses must be based on higher skills including a comprehensive understanding of the industry, the entire plant, the suppliers, and the markets. For commercial printers, industry-wide training is advocated as an essential response to the computerization of information in both text and graphic forms, customer control of document creation, flexible printing technologies, nonimpact printing, and nonprinting methods of document dissemination. For newspapers, industry-wide training is heralded as necessary to create and sell new forms of advertising, participate in emerging forms of information distribution, and effectively operate the massive and time-sensitive newspaper printing process.

Despite technological and market forces that seem to favor work organization that requires a broader knowledge-base among workers—training in all aspects of the industry (AAI)—and evokes widespread enthusiasm for that type of work organization among industry leaders, progress in transforming the actual production process has been slow. So far, the dramatic technological developments have certainly displaced many skilled workers, but firms have not succeeded in bringing about fundamental transformations of the organization of work. Furthermore, there has not been a widespread emphasis on AAI. Most firm-based training for production or hands-on workers is task- or occupation-specific. To the extent that there is an emphasis on AAI, it is on education for executives, sales personnel, and supervisors.

In this section, we provide background information on graphic communications industries—both commercial printing and newspaper publishing. We then outline recent and anticipated developments in the industries and their implications for training and education, emphasizing the barriers to the development of innovative production processes based on extensive use of AAI-oriented education.

Industry Fundamentals

Commercial Printing

The printing industry has grown significantly in the past decades, spurred by new products; faster service; flexible solutions to customer demands; and often, better products. Printing is one of America's largest industries. The core of the commercial printing industry generates $80 billion annually. Another $50 billion is produced by in-house printing plants and package printing (Printing Industries of America, Inc. [PIA], 1990).

There are about 40,000 commercial printing firms in the United States. Most firms are small, employing less than twenty workers on average and generating less than $2 million in annual sales.

By firm size, the industry breakdown is as follows (PIA, 1990):

Annual Sales	*No. Firms*	*No. Employees*
More than $50 Million	150	Over 100
$10-50 Million	500	20 to 100
$2-10 Million	7,500	20 to 100 (also)
Less than $2 Million	32,000	Under 20

From one-half to three-fifths of all commercial printing is related to advertising. This includes direct mail, inserts and coupons, labels and wraps, catalogs and directories, other advertising and free circulation papers, and magazines and other periodicals. Another third of the commercial printing industry is directed at business-related services and information. This includes annual reports, business forms, business communications (stationery), manuals and technical information, and quick printing. Book manufacturing represents about 7% of the commercial printing industry, although a portion of this work is more properly categorized as business-related and, increasingly, as advertising.

The printing trade services (about one-tenth of the industry revenue) are part of the printing industry itself (e.g., shops that prepare type). However, greater customer control of the pre-press process (e.g., desktop publishing) means that nonprint industry businesses are using printing trade service shops independent of the traditional route via the printer.

Newspaper Publishing

American newspaper publishing is a $37 billion industry. Approximately $31 billion (84%) of that amount is from advertising, and about $6 billion (16%) is from selling newspapers.

There are 1,586 daily papers published in the United States. Of these, 1,336 (84%) have a circulation of under 50,000. The balance, 250 papers (16%), have a circulation of over 50,000.

The industry employs 462,500 people. The total workforce has decreased in the last several years from a high in 1987 of 469,700. Employment declines resulted both from a loss of newspapers (159 fewer papers since 1980) and from labor-saving technology (Newspaper Association of America [NAA], 1992).

Newspaper plants are both capital and labor intensive. The large workforces reflect the fact that the newspaper business is a classic "crunch" industry. Production is time-sensitive, and there is only limited ability to spread the workload across a long period, although new technology does allow a more even distribution of work.[3]

The ability of newspaper publishers to replace labor with technology has been the industry's central dynamic for the past thirty years. Beginning in the 1960s, large circulation papers replaced linotype setting with teletype setting, a process that used punched tape to automatically produce hot metal type. One operator tending three automatic linecasters could replace seven or eight linotypists. Metroset, the next major innovation, replaced hot metal type completely. A fully automatic process phototypesets electronically produced images. Editors lay out pages and arrange images in digital format on computer screens. This information is then directly and electronically transferred to plates.

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[3] This is accomplished with automated equipment that can mechanically save and reintegrate newspaper sections that were printed before deadline. Many Sunday sections, for example, can be printed throughout the week and saved for retrieval on Saturday night. Key to this process is new machinery that requires little manual labor. Papers have always had the ability to warehouse preprinted material, but storing and reintegrating it into each paper was a labor intensive and slow process.

Advertising inserts also are mechanically collated with the paper at final assembly. The inserts are frequently printed at a site distant from the newspaper plant, occasionally in Canada or Mexico.

Recent Newspaper Market History

The percentage of the adult population who reads a newspaper each day has declined steadily in the last 30 years. U.S. newspaper associations claim that readership has dropped from 79% in 1960 to 62.6% in 1992.[4] A graph of this data shows a linear drop of about .5% each year. Others (Meyer, in Jones, 1991) find the plunge more precipitous—from a daily readership of 73% in 1967 to 50.6% in 1988, or nearly a one percent drop per year.

To date, the general population increase has more than counterbalanced the readership percentage losses; that is, the newspapers have a smaller slice of the pie but the pie has grown very big—to 252 million people. The population's growth rate, however, has slowed since the baby boom.

Recent newspaper advertising revenues have also declined. Newspapers have suffered a three-way loss as advertising revenues have fallen in the retail, national, and classified segments. In previous economic downturns, one segment would usually counterbalance the other but for the first time in fifty years this pattern has not occurred. In addition, television and other media compete aggressively for advertising revenue.

Last in the litany of newspaper industry travails are shifts in disposable time and lifestyle choices. Publishers are concerned about the amount of leisure time people have and their desire to read a newspaper. Our interviews and the industry literature reveal anxiety about new forms of entertainment (e.g., cable TV and videotape rentals), increases in dual-career families, longer commuting times (often associated with dual career households), and changes in work schedules.

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[4] There are (inevitably) methodological issues in the measurement of readership: In 1960, adult was defined as 21 years or older. Now, adult is defined as 18 years or older. Newspaper readership of 18 to 21 year-olds, however, is usually very low. To adjust for the differences in readership population, the original 1960 figure was lowered from the actual percentage (80%) to the one reported (78.5%). Also, in 1960, all readers in the household were interviewed. In recent surveys, only one reader in each selected household was surveyed. The implication of this change is reportedly of little statistical consequence. (Joseph J. Lorfano, Director of Public Affairs, American Newspaper Publishers Association, personal interview, October 1992; Albert Gollin, Research Director, Newspaper Advertising Bureau, personal interview, October 1992.)

Many newspaper publishers are seeking other forms of revenue to replace the traditional newspaper format. More than 140 newspapers offer on-line access to full-text databases. Seven newspaper companies provide a variety of on-line data services for business and professional markets. Over 600 newspapers are offering voice information services. Most newspapers are examining their delivery system as a revenue source, competing with UPS or local package delivery firms.

Occupational Segmentation—Three Stages of the Printing Process

The printing process is divided into three broad stages. These include pre-press, press, and post-press.

In the pre-press stage, workers prepare the plates that are mounted on the printing presses. This requires many skilled workers who plan and prepare page layouts; photograph or scan prints, graphics, and pictures; and work with the mechanical or chemical processes used to make plates. Color printing is particularly difficult because the paper must be exposed to a plate more than one time—usually two or four times. This requires the color from the original pictures to be separated into two or four basic colors. Individual plates are made for each of these colors. This highly skilled process is referred to as color separation.

In the press stage, the ink is actually applied to the paper by the press. In addition to loading paper and tending to the mechanical operation of the presses, press operators must also regulate the amount and consistency of the ink. Once again, this is particularly difficult when color is involved.

The post-press stage primarily involves collating and binding the finished printed paper. In this stage, workers must oversee the operation of mechanical equipment that collates the printed pages, staples, glues, or otherwise binds the pages, and prepares the finished units for shipping or mailing. In the past, this stage has required many less skilled or semi-skilled jobs mainly involving loading, unloading, and tending machines.

Technology and Skills

During the last few decades technology has profoundly influenced the labor process in the industry. Perhaps the best known innovation has been the shift from hot to cold type in newspaper publishing which eliminated the jobs of thousands of skilled linotype operators. Due primarily to this example, some authors have argued that printing has followed a classic deskilling pattern in which technology was used to replace skilled craft workers with semi-skilled machine tenders (Wallace & Kalleberg, 1982).

But until recently, technology has not fundamentally altered the basic organization of tasks in printing plants. In most shops, key elements of the printing process remain under the control of highly skilled blue collar workers rather than of supervisors overseeing low skilled operatives. Running a printing press never became sufficiently routine or standardized so that it could be placed under the care of a semi-skilled worker. Pushing paper through a large machine at a rate of tens of thousands of pages per hour while marking each piece with exactly the same inks three or four times in the same spot is a complicated and exacting process. Inks and paper, moreover, differ batch by batch, hour by hour, and require a skilled eye and hand to regulate. Press set-up is regarded as equally if not more exacting.

Industry Fragmentation

Until recent years the pre-press, press, and post-press stages were sharply separated. Within the pre-press and press departments, skilled workers often learned their skills through apprenticeships and maintained a strong occupational focus characteristic of craft-like work organizations. Thus, although the work was skilled, the technology and the history of the industry promoted a fragmentation of the production process.

The industry structure tended to be fragmented as well. Printing was a specialized task requiring special equipment and skills, which tended to promote a sharp division between printers and their customers. Thus, until recently, graphic arts customers could not control the printing process or the technical preparation of material for the press (pre-press). Customers came to printers with texts and photographs (or negatives and camera-ready drawings) and relied on the printer to arrange for subcontractors to prepare type, prepare the graphic images for the printing plates (e.g., color separators), develop a layout of pages, arrange the structure of the signatures (uncut groups of pages), and oversee a range of other tasks or services. Printers acted as master contractors to various industry participants. Printers would then print the job on their presses and probably perform the collating/bindery work (post-press). For the most part, the printing industry was vertically segmented.

The printing industry was also horizontally segmented. Printers of magazines, for example, could not efficiently sell less elaborate services such as printing a brochure or an invitation. Plate preparation and set-up costs of large presses make small jobs prohibitively expensive. Similarly, those in the packaging business had neither the equipment nor expertise to print a book or a notice.

Technological Change, Industry Integration, and New Forms of Competition

Technological change in recent years has accelerated, affecting both the nature of jobs and skills and the vertical and horizontal segmentation of the industry. Computerization has the potential to eliminate many of the jobs in the pre-press stage. It will be technologically feasible to prepare plates on a monitor, avoiding complicated color separation processes. The fewer remaining jobs will still require high levels of skill, but those skills will be significantly altered. New presses are also increasingly computer-regulated. In addition, many print jobs are now performed with plateless or nonimpact printing methods (e.g., laser), obviating the need for plate preparation. Elements of color printing have been automated or semi-automated. In many cases, small or medium size shops can offer services previously available from only large print firms.

One important characteristic of the new technology is its potential to increase the interaction or even blur or eliminate the boundaries among the three stages of the printing process. This is particularly true of the relationship between the pre-press and press stages. Complete computerization could allow the integration of plate preparation (or its equivalent in a nonimpact process) and printing, much as image preparation and printing are integrated by word processing systems of desktop publishing.

In addition to weakening the traditional craft-based occupations, the new technology is beginning to alter and reshape the nature of competition in the industry and the relationships between producers and customers. Developments in the industry have encouraged more interactive relationships among printers, their suppliers, and customers. We see this as a result of the emergence of competition from three nontraditional sources:

1. The first nontraditional source of competition is paperless or print-free communication—electronic mail, CD-ROM, laptops, videotext, FAX, electronic forms of manuals and technical documentation, electronic data exchange, electronic catalogs, and electronic replacement of business forms and communications. Much jest has been made of the futurists' promise of the paperless office. In fact, to date, the computer industry has been one of the better customers of commercial printers. But the tide is changing. Most large firms and agencies have instituted electronic data transfer for routine transactions. Ford Motor Company switched to electronic invoices from its suppliers a decade ago. The 1990 detailed census data is being published on computer tapes and CD-ROM, and technical manuals are increasingly issued in digital format.

   The commercial printing industry will not be put out of business by these new forms of communication, but several existing and emerging markets will contract. The changing market and new technologies, moreover, challenge the knowledge base and skills of printshop workers and managers. Printing education and training are likewise on notice.

2. The customer is the second nontraditional source of competition. Many firms now have the capability of producing printed products that previously required a printing plant. Desktop publishing, laser printers, and sophisticated digital photocopy equipment allow conventional offices and firms the ability to publish high quality materials themselves. Commercial printers must now compete with their own customers on the basis of faster service, better products, greater convenience, more knowledgeable staff, or access to an essential (and usually expensive) piece of equipment (e.g., a high speed color press or bindery machine). Printers must be able to work with their customers in ways that were previously unimaginable. Many printers see themselves as teachers as well as business persons (Gibson, 1991), helping clients produce documents that conform to industry standards—thus enabling printers to secure work for their presses and to coordinate with intermediaries such as color separators. Previously, such work was handled within the shop or by networks of professionals.

   Thus, printers now may have to be content with a small portion of the job rather than the total process. As part of this process, printers' staff must be knowledgeable about the range of options and about each step in the entire design and production process. Printing staff increasingly face customers who are fully conversant with printing products and processes. Given these developments, the salience of broad-based training is repeatedly emphasized by industry spokespersons.

3. The third nontraditional form of competition is internal to the industry—generated by firms that can employ new equipment to enter markets that were previously not in their purview. Big shops can efficiently take on small jobs or limited runs, and small shops can offer some services previously requiring the kind of equipment found only in larger firms.

The market shifts facilitated by improved technology, however, will not affect large and small firms equally. Larger firms are predicted to gain the competitive advantage, benefiting from broad regional marketing, global sales, satellite offices that can electronically send documents to a central printing plant, large presses capable of short runs, and well-trained staff with active training programs. Broad-based training, in fact, is seen as a key advantage for larger firms: Training costs will be higher for smaller firms than for larger; smaller firms also will be more vulnerable to losing well trained workers to larger firms and to customers (PIA, 1990, Chapter IV, p. 4).

According to industry reports, the best hope for smaller firms is to be found in personalized service and in "close working relationships with customers, links between customers' and printers' software and equipment, and more value added services" (PIA, 1990, Executive Summary, pp. 3-4). Unfortunately for smaller firms, larger firms are also given the same advice; larger firms are more likely than smaller firms to have the resources to achieve these goals (PIA, 1990).

PIA (1990) urges printers of all sizes to achieve "vertical integration" into their client's "markets, pre-press functions, post-press functions, and distribution" (Executive Summary, p. 4). Where vertical integration will not ensure success, printers are told to seek "horizontal integration into nontraditional technologies and products and into new media, such as electronic databases. . . ." (Executive Summary, p. 4). Again, training of personnel to understand customers' needs and processes is held to be essential.

Interviews with members of the newspaper business and review of the industry's journals mirror the training perspectives of the commercial printing industry. Enhanced skills and coordination are seen as necessary to respond to new technology and processes.[5] Highly complex machinery, technology-induced labor reductions, increased speed of operation, and larger plant sizes are each seen to require greater coordination of activities and worker skill development. Collectively, they are regarded as absolute motivation for plant-wide training. Greater worker skills, in addition, are said to be necessary to compete in emerging markets such as data retrieval systems, package or catalog distribution networks, or tightly targeted newspaper segments and inserts.

Broad-Based Skills and the Industry's Future

The next decade will see many of the new technologies become dominant, continuing the major shifts toward computerization of most printing processes, greater ability to interchange printing methods, merging of markets, and even more involvement of customers in their printing work.

The commercial printing industry associations stress that workers need broader knowledge and skills if their firms are to be competitive. As we found in our interviews and as is ubiquitous in printing industry publications, printing industry representatives emphasize the importance of broad-based knowledge and training—enabling printshop personnel to select the most appropriate technology and to interact with technically sophisticated customers. The following is typical of the views:

> Continual training and retraining of workers will become crucial as printers strive to keep up with more advanced versions of current technology, new printing technologies, more sophisticated customers, and the restructuring of printing businesses will become crucial during the decade. (PIA, 1990, Chapter IV, p. 1)

In fact, the PIA (1990) report, *Printing 2000*, further argues that even suppliers to printers will require employees with greater understanding of the industry and must receive frequent training and cross-training. Newspaper publishers also stress worker training and cross training as required for new markets, faster presses, flexible distribution systems, and smaller workforces.

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[5] Information comes from interviews with newspaper training managers; Newspaper Association of America's training, marketing, and research personnel; and review of *Presstime*, the association's monthly journal. (Note: At the times of the interviews, some of the personnel were employed by the pre-merger organizations American Newspaper Publishers Association and the Newspaper Advertising Bureau.)

Given these forces and projections for continued technological and market advances, both commercial printers and newspaper publishers are focusing on several trends and on their implications to training. As identified by industry experts and in our interviews with PIA, American Newspaper Publishers Association, and Newspaper Advertising Bureau, these developments and training issues are the following:

- In the commercial printing industry, the 1990s will be the first decade in which most or all of pre-press work will be in digital formats. All employees must be trained to understand and use digital pre-press and data transfer formats. High speed communications will transmit files and documents among vendors, clients, and end users. Printing firms and customers will rely on this means of transmittal. Employees will have to know how to use electronic proofing systems and how to send and receive electronic files.

- For both commercial printers and newspapers, global processing will increase. Customers with jobs that are not very time sensitive will shop their work throughout the world. Newspaper inserts, for example, will be printed wherever the cost is least. U.S. commercial printers will have to understand how to integrate their work with work done in foreign countries on different types of machines and alternative paper formats. In general, global competition will increase pressure on costs and services.

- Commercial and newspaper printers will face clients who insist on greater control over production of camera-ready copy or electronic equivalents. Commercial printing employees must understand the processes well enough to deal knowledgeably with clients. Newspapers will receive advertisements and other data in digital form. Pre-press staff will be required to quickly integrate several input formats.

- More complicated presses will require better trained workers. In the newspaper industry, training to operate new presses will double. Computer-operated controls and computer-assisted analyses will increasingly automate adjustments and provide real-time press run information. However, it will still be necessary to fully understand the process, and newspaper pressworkers will still have to climb around the press for inspection and maintenance. Presses with expert systems and artificial intelligence (AI) will assist the monitoring and adjustment.

- Workers operating large newspaper printing presses (web press workers) will need to integrate forward (pre-press) and backward (post-press—finishing and binding) processes. Pressworkers will have to understand the total production process. In modern newspaper plants, integrated computer systems will help coordinate plant-wide processes. In commercial printing firms, pressworkers will be responsible for coordination with the rest of the operation.

- In commercial printshops, cost pressures on the labor-intensive post-press operations will spur automation in binding, finishing, and robotized materials handling. Employees who are staffing the remaining positions will have to understand the new equipment and be able to repair it if necessary. In newspaper plants, new mailroom technologies have already altered much of the post-press process. Modern equipment can assemble and re-assemble papers printed earlier in the day or week. The equipment can also integrate advertising inserts, magazines, and special sections targeted at small areas.

- In newspaper plants, mailers will move from manual labor and machine loading to high-tech machine operators. They will control complex machinery that involves hours of routine monitoring interspersed with minutes of breakneck repairs and adjustments.

- For both commercial and newspaper plants, technological failure will pose a greater danger than before. Computer-assisted diagnostic reports will speed maintenance and repair, but training to repair expensive and complex machines will be even more essential than previously.

- Because of technological developments, printshops now have the ability to use a variety of printing methods to accomplish the same tasks. The relative advantages of different types of presses and of pre-press and bindery equipment are changing. Several different types of printing presses can produce similar results. At the pre-press stage, text and graphic images can be generated with many methods and in differing formats. New bindery techniques offer a range of options at similar prices. Commercial printing employees will have to understand the pros and cons of each press or technique, and recommend the most appropriate methods to clients.

- In a parallel fashion, modern newspaper printing technology now generates production strategy options. Thus production staff must make decisions about when to print material, where to print it, and how to integrate it. Previously, the technology did not allow such flexibility.

- All printing plants must generate less waste and must use less dangerous inks than is permitted in current practice. They must also recycle waste paper and use equipment to capture used chemicals and inks. Workers will need a good understanding of environmental issues and of regulations from the Environmental Protection Agency and other agencies. The newspaper industry now routinely publishes the tonnage data on recycled newspapers (approximately two million tons, almost all of which is used by newspapers); and PIA recently hired a former Environmental Protection Agency Ph.D. chemist to assist them with the training of printing firms' personnel.

- Customers will become more sophisticated, shopping for quality and values. Printers' employees and newspaper advertising staff will have to become more knowledgeable about customers' needs and capabilities. Printshop employees will have to learn to handle electronic media and multimedia. Newspapers are shifting to color to increase advertising revenue, advertising effectiveness, and readership; their staff must be trained to work with the requirements of a color medium.

All of these developments suggest the need to move away from the traditional fragmented, albeit still skill-based, organization of the traditional printing shop. According to these views, workers will have more interaction with workers in other occupations and departments as well as with customers. Moreover, they will have to have a better understanding of the overall context in which they are operating and the needs and interests of other departments within the plant and of the firm's clients. This clearly seems to point to a greater need for training in all aspects of the industry.

Organizational Reform and Training in the Printing Industry

In the previous section we argued that economic, technological, and market forces create a situation favoring firms that use decentralized organizational forms and that develop innovative relationships with their suppliers and customers. These strategies in turn call for new types of education and training that emphasize broader skills and knowledge about AAI. Later in the report we shall focus specifically on educational institutions that serve the industry, but this section takes a closer look at printing firms themselves to assess the extent to which they have both shifted towards innovative forms of organization and begun to emphasize broader approaches in their own training. We conclude that these innovations have spread slowly. Much of this section is then devoted to a discussion of the barriers that stand in the way of organizational and training innovation.

The Spread of Organizational Innovations

Some firms certainly have begun to adopt new work practices and organization. Strategies such as Total Quality Management have attracted considerable attention. A recent study of printing firms in Wisconsin found that some firms had tried to develop a more flexible approach to production with a greater emphasis on teamwork and cross training (Center on Wisconsin Strategy, 1991). The printing firm Quad/Graphics has received a great deal of attention in the press for its progressive production systems.

Management, especially the management of large newspaper groups, is increasingly introducing comprehensive forms of training. The ability of larger newspapers to support training departments facilitates this effort. In addition, many union and worker organizations are concerned about productivity and are participating in plant-wide training programs in an era when jobs are threatened.

But, as is the case in many industries (see Bailey, 1992), a more broad-based look at the industry suggests that the majority of firms still use traditional approaches to work organization as well as training. Our field work in firms suggests that even for the most forward-looking businesses, it is difficult to break out of traditional forms of work organization. Workers still specialize in particular functions, determined primarily by the technology. While there may be more interaction among those working on particular machines or within departments, the type of interdepartmental interaction and communication that would require broader knowledge is rare. For example, the Wisconsin study cited earlier found interest in work reform but could cite only a couple of examples where firms had made significant progress, and reform efforts in those firms were recent.

The Spread of AAI Training

Similarly, firms have moved slowly to provide broader based training to their own employees. Even the most dynamic printing firms with extensive in-house training programs do not provide broad-based training for hands-on workers. We interviewed representatives from the commercial printing industry's trade association, major printing firms that stress workforce training, small printshops, a major industry union and union training programs, universities and research institutions, vocational educational schools, and vendors with well-known training programs. Contrary to our expectations, we did not find widespread training for workers that encompasses industry-wide perspectives or curricula. Most training and educational programs are task- or occupation-specific, especially when the programs are directed at hands-on workers. There is, in contrast, more industry-wide training designed for executives, sales personnel, and supervisors.

This general conclusion was substantiated by extensive interviews with training personnel, senior management, and workers in a firm that is considered the industry leader in training. The firm's extraordinary growth and widely recognized product quality are attributed to its dedication to training including an emphasis on broad-based training. And indeed we found that the firm does train far more than most. Workers were encouraged to learn as much as possible about their tasks and the processes they operated. They were given opportunities to experiment. Many were given additional training in measuring productivity and output.

Sales staff received training in all aspects of company operations. The initial orientation session lasted up to six months and was significantly longer than that offered by most industry firms. Managers were able to coordinate their activities via joint meetings, electronic mail, and a shared bank of offices. Production managers were cross trained in all other production departments. Managers also participated in extensive joint training on measurement, accounting practices, cost-benefit analysis, and quality control. We failed to find, however, an institutionalized program of cross training or plant-wide training for hands-on workers. The program for production workers that came closest involved giving workers an opportunity to take training on other machines and processes—but on their own time.

We conducted interviews at a recently built New York Times plant in New Jersey and found the organization's commitment to training of hands-on workers to be very evident. However, the sophistication of each of the machines made it difficult to train workers on all of the equipment. Among workers, only maintenance staff were trained on all of the operations and on the plant's engineering support systems.

Barriers to Training Innovation

Why have firms been so slow in moving either towards organizational innovation or broader training? In our field work we uncovered a variety of barriers that thwart training and organizational innovation in the firms. Although there are many individual issues, these barriers can be grouped into three broad areas:

1. First, executives believe that the *labor supply* available to the printing industry is inadequate for ambitious training and organizational innovations. This is blamed on the negative image of the industry (which complicates recruiting) and on the educational institutions that train and prepare potential recruits.

2. Second, the *day-to-day imperatives of production* and the need for workers to learn the specific requirements of increasingly complex machinery, makes broader training for AAI appear to be a luxury for hard pressed employers.

3. Third, *AAI training threatens traditional boundaries* between unions, professional associations, long-lived conceptions of the separate functions within the printing process, and sometimes even separate roles associated with particular ethnic groups.

We shall focus on each of these three broad areas.

The Industry Labor Supply

In general, the educational institutions and programs that serve the industry, with some exceptions, have continued to focus on traditional, more narrowly conceived approaches. In some cases, employers do not believe that printing educational programs are adequate to serve even as a basis for broader training on the job.

Many industry representatives now believe that the blue collar workers attracted to the industry are not capable of understanding the industry's range of processes and machinery. Managers believe that bright young people are not attracted to the industry because it has a dirty and unexciting reputation. As a result, PIA launched a public relations effort to influence high school students. Brochures are sent to high schools and guidance counselors. In addition, PIA supports a formal school-based effort, the PrintED program. Started by a Georgia PIA affiliate, PrintED is designed to certify both high school programs and postsecondary programs in printing. Its unstated goal is to encourage the entry of bright students who might otherwise not consider work in graphic communications.

The PrintED program is a direct link between educational institutions and the industry. It certifies programs in specialized graphic arts fields including Introduction to Printing, Image Assembly and Platemaking, Art and Copy Preparation, Duplicator Operations, Reproduction Photography, and Electronic Imaging. Each field is separately evaluated by an industry certification panel. Approval is believed to increase recognition from local and state departments of education as well as support received from local firms. Graduates of the programs are granted experience credit which is equivalent to six months of on-the-job training. But while the PrintED program may improve the quality of training and recruits, its growth indicates the strength of the perception among managers that the industry has recently been unable to attract a labor force of adequate quality.

Furthermore, when employers do hire workers who have some printing training in vocational or technical high schools, they often lack confidence in their skills. The industry appears to take the high school and community college programs as preparatory for further training, not as certification of the ability to work at any skilled task. While graduation from such a program may significantly enhance the probability of being hired, it provides few advantages beyond that threshold. Once in the shop, graduates of these programs are assumed to require the same sort of training as those without the educational background.[6] Printing program graduates are not assumed to possess a more broad-based understanding of the industry than those without the schooling. Little effort is made to build an industry-wide perspective on the vocational education foundation of these students.

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[6] An important exception is noted: Some formal apprenticeship programs reduce the required number of years for vocational education graduates.

Industry associations also offer training. Both PIA and the Newspaper Association of America (NAA) offer extensive training programs, but for the most part this training is designed for managers and higher level technicians rather than production workers.

The printing industry is likewise served by about a dozen established educational programs at leading universities, including California Polytechnic, Carnegie Mellon, Rochester Institute of Technology, Clemson, and Western Michigan University. These programs offer students the chance to study with scientists and experts who are developing the techniques and processes that will define printing in the next several years or decades. Many of the faculty have spent time in industry and continue to consult. While most students specialize within departments, there is some opportunity for a broader exposure to the industry. But not surprisingly, these programs serve the students who are or who will be managers, high level technologists, or research scientists, having little impact on production-level workers. Thus, the finest institutions serving the industry do not participate in the training of workers and cannot provide them with the recommended industry-wide perspectives.

University-Based Service Programs

Many of the principal universities with programs in graphic arts also offer extensive programs for newspaper and commercial printers. These programs draw on the expertise of the research and teaching faculty as well as that of specific process experts, management theorists, and experienced craftsmen. In some cases, the industry service side of the school is as well-known as the academic side.

The Rochester Institute of Technology (RIT), where we interviewed both academic and industry service program leaders, illustrates one of the stronger programs in the field. Although academic student enrollment has declined in the past few years, the industry side, the Technical and Education Center of the Graphic Arts, has been thriving through the following aspects:

- Over 200 *seminars* for graphic arts specialists, paper and ink manufacturers, editors, designers, photographers, managers, salespeople, scientists, technologists, and engineers.

- *Custom programs* for companies and for trade organizations. The programs are at RIT or "on site," and address issues of quality control, hands-on training, supervision, and so on.
- A *consulting facility* for the industry, called the Laboratory for Quality and Productivity in the Graphic Arts. The laboratory seeks to help firms improve their manufacturing quality and staff performance.

Some of the programs offered by RIT provide a broad-based perspective and some are directed at hands-on workers. But such foci are the exception rather than the rule. Most of the programs address specific processes or machines; few are directed at hands-on workers. Thus, while RIT's Technical and Education Center offers the types and range of programs appropriate for broad-based training, it ultimately highlights the lack of such training for most of the industry. In noting this, we do not criticize RIT's programs or those offered by similar institutions. Rather, we suggest that such programs underscore the barriers to broad-based training efforts and the scarcity of such training on a routine basis.

Thus, industry managers do not have confidence in the production level workforce that they can attract, either because they believe that more able workers will simply not want to work in the industry or because schools preparing students for the industry are not adequate. This promotes a survival mentality in which employers try to meet immediate demands through short-term and very specific training. But while the industry is focused on the short-term, it is only more far-sighted thinking that might promote a strategy to enhance the broad skills of the industry's workforce through education in all aspects of the industry.

The Day-to-Day Imperatives of Production

The printing industry is highly competitive and much of its production is tightly scheduled. In the previous section, we argued that the educational traditions of the industry and perceptions about the available labor force led employers to focus on short-term specific training. In a parallel fashion, we find that in each firm's attempt to meet the day-to-day imperatives of technology and production, longer-term training strategies are often neglected. Especially in commercial printing, which is dominated by small firms, broad-based training appears to many managers as a good strategy but one that they do not have the luxury to pursue. Ironically, while faster technological change is one argument for broader training, the constant change and uncertainty often force managers to focus narrowly on the immediate needs, once again pushing longer term consideration off to some future time. We shall consider these problems in more detail below.

Average Size of Firms/Plants

Most commercial printing industry firms are small, employing less than twenty workers and generating less than two million dollars in annual sales on average. The firms cannot justify separate training departments or specific training personnel. Small shop owners told us they cannot afford to take the time for even one worker to train another. When training occurs, it is usually on an as needed basis, which is almost always task-specific. Experienced workers concentrate on production deadlines and usually do not have the flexibility to attend training seminars.

The average small shop size also reflects the commercial printing industry's market segmentation. Each shop tends to specialize on a limited set of activities and does not offer the full range of processes and equipment associated with modern graphic communications. While employees are increasingly working with other shops and with more demanding and knowledgeable customers, employers point to their limited service range as another reason to focus training on the immediate needs of the shop. Given the constraints stemming from their small shop sizes (and time sensitive production schedules), most commercial printshops do not feel they can justify or afford broad-based training.

The Pace of New Technology

Computerization is in the process of transforming the printing industry and has created the potential for elimination of many jobs and for the dramatic reorganization of the printing process. Commercial printing employers face the simultaneous problems of raising capital for more sophisticated technology and training or retraining workers in response to major equipment purchases. Overwhelmed by recent innovations and by the promise of even faster progress, many employers and many workers claim they are not sure what type of training will prove most helpful in the coming decades. The conflicting signals generate indecision and, often, less interest in training than might otherwise be the case. Broad-based training often appears to be ignored in the deliberations.

Newspaper industry participants are also confronted by dramatic changes in technology, but they face training challenges different from those of the commercial printers. The complexity of the new equipment compels them to conduct solid training programs. That same complexity, however, is referenced to explain why worker training must focus on individual machines or processes. The new machinery requires so much specific training that plant-wide or AAI training for most hands-on workers appears to be an expensive luxury for hard pressed training managers. The one exception to that practice is the maintenance staff, who must understand the plant infrastructure as well as the interrelationships of the departments.

For example, the New York Times recently built a state-of-the-art newspaper plant in Edison, New Jersey. The many processes are integrated via a complex computer network. The schedule of training programs is itself a massive document, and the coordination required to train the workforce is remarkable. Much of the training is being conducted by equipment vendors, either as a part of an equipment purchase agreement or as an added cost. Vendor training (discussed below) is almost always machine-specific and thus is not comprehensive. Even when vendors are not the exclusive trainers, the number of operations and the amount of new material discourages worker training not focused on defined tasks.

Vendor Training

Worker training supplied by the manufacturers of major equipment—vendor training—is always machine-specific. Almost by definition, vendor training cannot be broad-based or industry-wide in its perspective. Vendor training therefore emerges as another barrier to industry-wide training.

Vendor training is a major form of vocational education in the commercial printing and newspaper industry. The reasons why vendor training is so important, and thus such a major barrier to broad-based training, must be further considered.

Our interviews with the commercial printing industry's trade group and with newspaper publishers' trade group reveal that both businesses are heavily dependent upon vendor training because "vendors are the only ones who can train workers on state-of-the-art equipment." Training on older equipment generally follows the craft tradition; training on new equipment is only available from its manufacturers. The vendors we interviewed echo this sentiment and expand on it. Manufacturers of presses and other graphic communications tools, developers of editing and printing software, and chemical suppliers claim not only that they offer training on the latest equipment, but also that they have the most extensive training with hands-on instruction and networks of schools and in-shop trainers. Many vendors also assert that they continue to train workers and supervisors long after the sale, when problems emerge or when new personnel are hired.

From the above comments, we might conclude that vendor training is influential because it is responsive to industry needs, technically up-to-date, and commands an established structure of schools and trainers. But this argument has several weaknesses. Many employers and workers told us that much of formal vendor training is ineffective, relying too much on manuals and classroom presentations. Industry association leaders pointed out that vendors don't "train the trainers"; "it's a one shot deal" with limited ability to build on the training. Also, several industry representatives, and even some vendors, admitted that a portion of vendor training is sales hype. A few firms noted they usually dismiss the vendor's trainer about halfway through the in-shop training program. Moreover, in the commercial printing sector, some union training providers assert that employers often send a "favored" employee for training, rather than the key or logical operator of the new equipment. (The reward is not necessarily the training but the paid trip to a distant city and freedom from routine work.)

Vendor training in the printing industry must be understood also in relation to the alternative training strategies. In the newspaper industry, the situation is more clear-cut than in the commercial printing industry. Modern newspaper plant equipment is massive and complex. New machinery is a major capital investment that is seldom if ever available in a school—even in the leading university training centers. Given the pace of technological development, workers are unlikely to have encountered the same equipment at a previous job. The vendors are thus the only ones who are prepared to train workers on the latest equipment.

The commercial printing industry, as mentioned above, is composed mostly of small shops. Few can afford training departments or even separate personnel to focus on training. Independent training manuals and videotape courses are sold in the trade association bookstore, but many of these materials focus on managerial concerns; few hands-on workers ever see the PIA catalog. The union-run schools, which we will discuss later, apply only to the ten percent who are represented by collective bargaining. These schools, moreover, may not offer courses on new processes or technology and are usually equipped with an earlier generation of machines.

In contrast, vendor training is typically offered when the new equipment is being installed and on the same machines being adopted. If offered in the shop, production is managed by the trainer while the workers learn. If offered at a training center, it is usually during a period of transition when production is hampered by the installation process. The shop owner finds vendor training attractive because it is coordinated with a production disruption and because the price is included in the cost of the equipment.

Union training personnel might add that employers find vendor training attractive because it further ignores the union training schools. Vendor training could also be interpreted as a denigration of workers' skills and understanding because it associates the ability to operate the new equipment with the manufacturer-installed controls and processes, rather than with the workers' craft skills. Vendor training makes the educational process part of and dependent upon employers' capital investments, not the printing workers' traditional high craft orientation and professionalism. In this sense also, it further reinforces a machine-specific training perspective.

A Challenge to Traditional Divisions

Many commercial printers are small businesses and they therefore lack the resources to organize specific training programs. To these businesses in particular, broad training appears to be a luxury. In contrast to the average commercial printer, newspaper plants are usually large, with very complex machinery and a history of separate departments, unions, and professional organizations. Plant-wide worker training is thwarted precisely because it threatens guarded boundaries. The division of labor has not become more flexible over time; newspaper departments are frequently compared to feudal fiefs. In many big city newspapers, occupational groupings are strongly ethnic (e.g., pasters are of one ethnicity, mailroom personnel are of another). Thus, in order to promote more integrated production organization and the broader training that must accompany it, newspapers would have to overcome historic divisions and loyalties.

Newspaper workers are keenly aware of labor displacement from new technology and the declining number of papers. Rigid job definitions have traditionally been job security measures. Cross-departmental cooperation and training can be seen as attempts to reduce labor costs and threaten jobs.

Many analysts argue that traditional adversarial relationships between labor and management has thwarted organizational innovation. While in some cases, unions have encouraged work reform as a job-saving strategy, in others, they have seen organizational innovation as a disguised attempt to reduce union influence and eliminate jobs. Indeed, union busting or at least union avoidance has been an element of work reform efforts for decades (see Bailey, 1992). In the printing industry, this conflict has particular significance for training since union-run schools have traditionally been an important, albeit not overwhelming, source of skills. Conflict over the future of the schools makes it more difficult for them to play an important role in broadening the training and skills in the industry. In a separate section of this report we discuss in more detail the union-run schools in the printing industry. We refer the reader to that chapter and, here, briefly note only those issues that address barriers to industry-wide training.

Although only 10% of the printing industry is unionized, union-run training schools have a distinguished place in the industry, going back to the beginning of the century. The schools are currently supported by (negotiated) employer contributions, and each school has a joint management-union oversight committee. In some areas, the union-run schools help train non-union employees, government printing agency workers, and even management.

In general, employers resent the fee required by the unions to support the school. This fee (from zero to several dollars per week per worker) is one of the first items suggested by employers for elimination at each negotiation session. More important, many employers claim that the schools reflect a tradition of labor that creates false work divisions among employees, reinforcing a segmentation of tasks and work. The schools, in other words, are said to reflect the unions' approach to restrictive work rules and overly specified job classifications.

The unions argue the opposite position. They claim that the schools provide exactly the sort of broad-based training desired by industry experts. In addition to requiring a range of courses that encompass many segments of the industry, the schools engender the tradition of craftsmanship that enables workers to learn new skills and improve productivity.

How do these different positions result in barriers to industry-wide training? The recession combined with ongoing technological displacement has not strengthened labor's position. The schools are under threat, and a few have recently closed. Many employers, though not all, are seeking to starve the schools of fees; of donated equipment; and most critical, of control over training for new skills (such as digital stripping). Thus, without money, up-to-date equipment, and legitimacy to upgrade and train workers for future jobs, many union schools are relegated to teaching traditional crafts that will not ensure future employment security. Certainly, also, the environment does not encourage the schools to expand their curricula to encompass more industry-wide training. At the same time, most employers feel they cannot afford to establish their own training programs because they must deal with increasing capital costs, market stress from new processes and new forms of competition, small workforces that must produce to deadlines, and the existing union education fee. As a result, training for any but the most directly applicable tasks is deferred.

Conclusion

Economic and technological factors appear to encourage organizational reform and associated broader training. There is certainly evidence of movement in that direction in the printing industry. Nevertheless, a variety of barriers appear to thwart those innovations. One of the important problems has to do with the educational institutions that serve the industry. In the next sections, we will take a more detailed look at some efforts among educators to broaden the training and preparation that they provide.

PRINTING SKILLS TRAINING IN UNION-MANAGEMENT PROGRAMS: THE GRAPHIC COMMUNICATIONS INTERNATIONAL UNION SCHOOL IN WASHINGTON, DC

Introduction

In the previous section, we identified three broad reasons why firms have not moved faster towards an innovative production organization or the broader training that might accompany it. We referred to these as issues having to do with the labor supply, educational programs, and institutions that serve the industry; the day-to-day demands of production; and the threat to traditional divisions and categories. In this case study of the printing schools organized by the Graphics Communications International Union (GCIU), we illustrate how these three factors interact. In particular, the educational strategy represented by these schools can potentially overcome some of the problems associated with the day-to-day demands of production, but this potential is for the most part blocked by the strength of the traditional barriers and divisions in the industry.

The GCIU schools are financed by a fee required of all firms that are part of the collective bargaining agreements in the relevant region. Workers attend the schools on their own time and teachers are all skilled craftsmen. The close contact with the industry creates the potential for the schools to keep up with the latest technology.

The schools offer particular advantages to the many small firms that cannot mount training programs themselves. Also, because the training is paid for by many employers, individual firms should be less concerned that workers who they train will leave to work with competitors. Thus, the strategy seems to offer a possibility for state-of-the-art training that need not interfere with the immediate day-to-day problems of the employers, especially small employers.

Uncertainty about the direction of technological change was one reason why firms were reluctant to train. Unfortunately, this uncertainty is not likely to be eliminated. Nevertheless, schools that are closely integrated with the industry and its skilled workers, as these could be, would seem to offer a possible approach to handling many of the problems associated with a dynamic technological environment. Additionally, technological uncertainty which leads to indecision regarding the specifics of future skill needs is one of the main reasons to promote broad training as an effective alternative to current skill-specific training.

But despite these apparent advantages, employers are turning away from the GCIU schools. Technological change is often not seen as something that generates a need for broadly skilled workers who have cultivated experience and a broad knowledge base through up-to-date training on the latest technologies. The GCIU schools could potentially provide this training. But many employers see new technology as an opportunity to rid themselves of expensive workers. Furthermore, they view new technology as a way to further weaken the influence of the unions which employers maintain are inflexible and have failed to adjust to the new environment. Employers argue that high labor costs put unionized employers increasingly at a disadvantage.

In any case, this conflict threatens the viability of this attractive training strategy. We shall develop this argument in detail in the rest of this section.

Context and History

The GCIU school in Washington, DC—the Graphic Arts Institute of Greater Washington—is one of seventeen Technical Training Centers operated by the union's locals with the generally reluctant support of the area's printing firms. The school serves apprentice workers with a four-year curriculum of courses and also teaches journeyman workers new skills and techniques. As with all GCIU training centers, the Washington, DC school is supported mainly by fees charged to employers as part of the negotiated labor contract. Also following the general industry pattern, the Graphic Arts Institute of Greater Washington is supervised by a union-management committee of local printing industry executives and local union leaders.

The history, operation, and outlook of the Washington, DC school mirrors the printing unions' worker training efforts throughout the nation. To understand the Washington school, we first review the educational programs of the union's parent and predecessor institutions.

The GCIU is comprised of, or built upon, several unions. One of the GCIU predecessor unions, the International Printing Pressmen and Assistants Union of North America, established the first technical school in 1911 at the union's headquarters' in Rogersville, Tennessee. Eleven years later, in 1922, another predecessor union, the Amalgamated Lithographers of America (ALA), created the Chicago Lithographic Institute, now the Chicago Graphic Arts Institute. The Chicago school is most notable because it established the model of jointly operated schools with a Board of Trustees that represented the Chicago Lithographers Association, the Chicago Newspaper Publishers Association, and the local ALA union leaders.

Building on the Chicago Model

Since the inception of the Chicago model, the evolution of the setting of the schools and the nature of their faculty illustrate some of the tensions between production and training and between the union and employers that complicate the development of a broad program.

Setting

- Many programs began by using the facilities of local companies during the nonproduction hours. Equipment was often of recent vintage and in good repair, and the location was convenient. Unfortunately, demands for overtime use of the equipment, the high capital and interests costs fostering second and third shifts, and the need for maintenance during the nonproduction hours proved formidable obstacles. These obstacles led to the overall abandonment of training at plant facilities for most programs.

- The schools also used existing public institutions such as community colleges or vocational high schools. While this venue is still in use by some union-management training programs (we visited one in our research), it was also found to be problematic. Program trustees appreciated the cost savings of renting space and facilities at an existing institution but resented the scheduling restrictions, class size limitations, use of often aged equipment, and what was occasionally viewed as intrusions into curriculum or faculty selection. In one case, the training program

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was forced to leave their site because of the election of a new school board, which altered the lease to an unacceptable rate.

- Other schools have also been able to make use of equipment manufacturers' demonstration or manufacturing facility. Usually offered at highly subsidized rates, such sites are economical and always furnish the latest equipment. The limitations, however, proved overwhelming. Equipment was limited to one product line or manufacturer, and locations were limited and often inconvenient.

- Some schools own their own facilities. This type of setting offers the fewest time restrictions (allowing courses at periods corresponding to non-shift hours), total control over space (rearranging equipment as needed or as available), and no possibility for others to influence faculty decisions. In fact, this type of setting is the mode favored by GCIU for its training programs.

There are, however, some significant liabilities to free-standing training centers. They are generally the most expensive of the available options and they rely on donations of used equipment from local firms. This latter reality requires most program directors to devote considerable effort to soliciting outdated or otherwise unneeded presses and bindery equipment from area enterprises. The directors must also secure donations of paper, ink, and other supplies from national vendors. Perhaps even more problematic, many students are taught on equipment that is obsolete, mitigating the pedagogic value of their effort.

Thus, the problem of the setting reflects a search for a venue that is close enough to the production process to reflect the realities of the workplace but is distant enough not to be distorted by the short-term interests of employers and the pressure of day-to-day production. In a broad sense, it is this tension that defines the advantages of broad-based education as well as the most imposing problems that thwart it.

Faculty/Trainers

Training program developers turned first to what they termed "professional educators," teachers in nearby vocational schools or community colleges. Professional educators, however, were soon rejected as inappropriate for these printing schools. Union-management committees found that they "lacked the technical background to relate the information to the workplace . . . [and] in some cases, the students from industry knew more than the professional educator" (GCIU, n.d., p. 5). The committees argued that they needed trainers who could teach a hands-on course focusing on the resolution of problems which occur during production, rather than textbook-based presentations on how to operate the machines (GCIU, n.d.).

The committees ultimately established faculties comprised of experienced workers who could instruct during their nonwork hours, on a part-time basis. The committees and program directors claim that their instructors are knowledgeable about current industry practice, present the material in nonthreatening and understandable ways, and relate the tasks to real production concerns. The union leaders also argue that the fact that both instructor and student are fellow union members enhances the pedagogic process.

As we discuss below, however, the same factors that make the instructors attractive to the schools also cause conflict with their supervisors about their availability for post-shift work. Instructors are often the workers most requested for overtime duty, but the need to meet a teaching schedule prohibits such flexibility. Perhaps because of this factor, one of the major problems for training directors is the availability of experienced instructors. (A few told us that they had to maintain a pool of instructors for each teaching position and that the director was often a substitute teacher.) Thus, once again, we can see a tension between the needs of education and production.

GCIU Training Programs Now

Collectively, the seventeen GCIU training centers employ almost 300 instructors, teaching over forty-five different courses. The number of courses offered at any one school reflects the size of the local union, the sizes and markets of printing firms in the area, and the interests of the workers. The number of job openings for apprentices also significantly determines the course list. The range of courses at the schools includes the following:

Basic Camera
Direct Screening I & II
Copy Conversion
Color Analysis
Litho Platemaking I & II
Proofing I to III
Web Press I to III
Gravure Retouching
Gravure Publication Layout
Press: Plate and Press
Health and Safety
Color Separation I & II

Gravure: Plating & Graining
Gravure Basic Layout
Basic Pressmanship
Feeder: Sheet and Web
Halftone Screening I & II
Scanning I, II, & III
Glass Screening
Stripping I to III
Step and Repeat I & II
Exposure Controls
Litho Art I & II
Transparency Stripping
Photoengraving I to IV
Gravure: Plate and Cylinder
Gravure Contacting
Gravure Packaging Layout
Ink and Paper Technology
Binding and Finishing

Several schools are also teaching courses on word-processing, electronic pre-press, and desktop publishing. It is clear from this curriculum that notions about training for AAI have not permeated these schools' curricula. The most progress in this direction is reflected in the survey or introductory courses that most schools offer.

Officially, GCIU and the industry association coordinate the work of the training centers. In practice, GCIU champions the schools, and the union's education department arranges school directors' conferences and distributes educational materials to the programs. Employers, it must be remembered, support the schools via a weekly education fee added to each worker's wages. This fee averages about $3.00 per week per worker, although it varies by shop (i.e., by negotiated contract with each local) from a $1.00 per week per worker to $7.00 per week per worker. Larger shops and those with more complex equipment tend to pay a higher fee per week per worker. The fee charged to a firm is not based on the number of workers from that firm who attend the school—although there will probably be a rough correlation between the number of workers in a firm's bargaining unit and the number of workers attending courses.

Some employers actively support the schools, but most view them as vestigial institutions from a time of rapid industrial growth and union muscle. Typically, each local contract negotiation starts with the employers' efforts to end the education fee. Recently, employers have been successful. In the past few years, three schools have been closed and the weekly education fees terminated in those areas.

In response to employers' efforts to reduce support for these schools and because of the declining numbers of apprentices, some GCIU training schools are enrolling students who are neither union members nor managers in firms covered by collective bargaining agreements. Also, as we shall see, some schools, including the Washington, DC training center, train federal employees on a contract basis.

The Graphic Arts Institute of Greater Washington

History

The first union-management printing school in the Washington, DC area was started in 1967 by the Amalgamated Lithographers of America (ALA) Local 13 and its contract employers. Following the ALA Chicago model of joint trusteeship, the facility was supervised by a board comprised of printing firm executives and local union leaders. Located in Alexandria, Virginia, the school had only twenty-five students, offered classes only in stripping, and relied on one part-time director.

Within four years, the school moved to the district, where its larger facilities enabled it to serve the several union locals that coalesced to form the GCIU Local 285—a merging of Photoengravers Locals 17P and 13L and their contract employers and, in 1977, the Bookbinders' Locals 42B and 144B.

The school has grown significantly and now has an enrollment of 239 students and a faculty of 21 instructors (all part-time). The Washington, DC area GCIU Local has 850 members, although a recent plant closing involving 150 workers will undoubtedly diminish the membership roles.

Authority

The Graphic Arts Institute of Greater Washington operates under the authority of the District of Columbia Apprenticeship Council and the control of the Joint (union-management) Board of Trustees. The school's director, however, seeks advice and counsel from the Executive Board of the Union Local when problems arise.

Although the school is theoretically a joint activity of the union and the firms, company representatives are not involved with curriculum development or faculty selection. Also, the school has not received any donations of capital equipment from local firms (or from any other source) in twelve years.

The lack of local employer involvement in the Washington, DC school (beyond payment of education fees) might be considered a mixed blessing. An example from St. Louis is illustrative. Employers there sought to enhance their control over the emerging job category of desktop publishing via the school's role in training workers.

The local St. Louis GCIU school board wanted to install Macintosh computers (Macs) to train pre-press operations. Employers refused. Employers did not want to pay a worker at the rate of a stripper—there, about $20.00 per hour—for work that was generally paid at $11.00 per hour. Our management interviewee added that in situations such as these, "even if unions win, they lose; the union shop can't compete, and jobs will go elsewhere."

The Facilities

The Washington, DC school is housed in a modest one-story building attached to the Union Local's offices. The five rooms that comprise the school are crowded, albeit neat, clean, and well-organized. Perhaps the central problem of the school is that in an industry with extremely rapid change, the equipment in the classrooms is not new.

For example, the school's pressroom has a 26-year-old single color press, a 13-year-old two-color press, and an 18-year-old two-pocket stitcher with a three-knife trimmer (for binding). The school's scanner is also outdated—13 years old.

The school does have facilities for teaching stripping, although the fact that strippers are being displaced by desktop publishing and other technologies makes many firms reluctant to invest in the new equipment. Thus, although the long-term outlook for strippers is dreadful, it remains a highly skilled craft with some short-term demand. Many experienced print journeymen are studying stripping as a stop-gap measure.

The school also has five IBM compatible 286 and 386 machines used to teach desktop publishing and word-processing. They are reasonably powerful and can operate the required software. Unfortunately, although the IBM compatible machines are adequate for the task, the industry seems to be using Mac-based equipment for desktop publishing. In addition, the school has equipment to teach a plate press class—dot etching, color key proofs, and cormalin proofs.

All the equipment was contributed by area firms. The school's director regularly collects excess or discarded printed material to teach bindery methods and also seeks contributions of printing supplies from local and national vendors. But as we pointed out earlier, local firms have not been generous with hardware in recent years.

Students

The GCIU training system classifies workers into the following three groups:

1. General workers are defined as not skilled and, theoretically, are not learning how to use the equipment.

2. Apprentices are workers who are approved by the union to learn how to use equipment/process. Apprentices must complete a list of required courses at the training school. They must start to take courses as soon as they apply for an apprenticeship-rated position within their firm. For apprentices, the motivation to attend classes is associated with an apprenticeship-rated job opening. Apprentices who graduated from approved vocational education programs may forego a portion of the four years usually required to complete the apprenticeship. Often, apprentice positions are limited to some ratio of journeymen at the shop (e.g., five apprentice positions per journeyman).

3. Journeymen are skilled and experienced workers/union members. Although the school traditionally focuses on apprentices, the declining fortunes of the printing industry and the related desire of journeymen to learn new, marketable skills has altered the usual student profile. A breakdown of the student population reveals that journeymen are the modal category, and apprentices occupy only about a third of the classes. Of the current population of 239 students, the percentages follow:

Students who are not yet apprentices ("general workers" taking survey course only)	5%
Apprentice students taking required apprentice courses	35%
Apprentice students taking nonrequired courses	0%
Journeymen taking courses for updating or retraining	60%

Almost all of the journeymen are learning skills for new technologies: desktop publishing and/or scanning (both of these courses have long waiting lists).

Some students have received previous training at secondary or postsecondary schools. The GCIU school views the printing programs at vocational education high schools and community colleges as feeder institutions. Students with previous training are usually granted reduced apprenticeship periods.

Course Requirements and Offerings

Courses are offered both before and after the work shifts. The first set of courses are scheduled from 11 A.M. to 2 P.M.; the second set of courses run from 5 P.M. to 8 P.M. Courses vary in length from nine weeks to thirty-four weeks, although most are thirty-four weeks. Most students take one or two courses at a time. A very few students take five courses at one time, almost one each day of the week.

The Joint Apprentice Committee establishes the curriculum requirements for apprentices. Apprentices must complete the following courses:

- Press Apprentice: Press I & II, Plate/Press, and Ink Technology
- Press Assistant, Helper, or Small Press Operator: Press I and Plate/Press
- Camera Apprentice: Camera I & II, and Stripping I & II
- Stripping Apprentice: Stripping I, II, & III and Camera I
- Bindery Apprentice: Bindery I

Once again, these curricula show little evidence of adherence to an educational philosophy based on providing broad knowledge about all aspects of the industry.

Retention

Most of the students who drop out of courses do so because they were laid off from their jobs and are forced to search for new jobs. Occasionally, shift changes demanded by the employer makes attendance impossible. More common are conflicts between school and employer about overtime. When plants are busy, the employers pressure workers to skip classes. This tension between immediate work needs and longer term educational goals permeates the employers' relations with the school and with the union leaders who view training as crucial to the workers' career viability.

Faculty

The school has a full-time director, a former worker who also teaches one or two courses and substitute teaches when necessary. All faculty are journeymen craftspersons working at local graphic communications firms. Some are graduates of this school. Currently, there are 21 instructors; all part-time. Instructors participate in curriculum development and have some latitude in the way they teach their classes.

The instructors are paid a wage for teaching that is less than their usual hourly wages. Finding good teachers is sometimes a problem. Some excellent craftspersons are not good instructors, although the union's "train-the-trainers" program shows signs of success in eliminating this problem. A more systemic obstacle is the journeymen's need for flexible hours required by occasional overtime requests (discussed above). Another, perhaps less quantifiable reason potential faculty are disinclined to teach is the anxiety over technological displacement. This issue is particularly salient for some of the instructors. Many strippers are "forced" to retrain as desktop publishing workers, with as much as a 50% reduction in wages. Teaching desktop publishing, thus, often represents a rear-guard action, not an enthusiastic acceptance of a new technology. Many employers, moreover, seek to define desktop publishing tasks as outside the purview of the union workforce. Equally difficult is the perspective of those who are teaching stripping. They know that they are teaching a skill that has no future for more than a fraction of the existing strippers.

Training: One Goal, Two Sides

Both union and management claim that they seek to foster industry-wide perspectives in their training efforts. Both claim that the other side is opposed to such a broad orientation. Management argues that the union prefers occupation-specific training because it is consistent with the union's system of job classification. In contrast, union leaders argue that management endorses occupation-specific training because it limits the workers' flexibility and allows management to introduce new technologies from which workers can be excluded. Some union leaders even claim that management is hostile to training in all forms because it empowers workers and threatens the distinction between management and labor.

The Union View

In interviews with the international union's leaders and its education director, we frequently heard the claim that employers only want to confront their "new" problems (e.g., training for a new machine or for a specific task). The union, in contrast, presents itself as concerned with larger, long-term employment issues such as developing flexible workers and avoiding technological displacement.

Employers, according to many union leaders, focus on training for just one piece of equipment and still think in terms of departmentalized workplace and workforces. Employers feel that they "have the latest equipment and are not interested in general training." In the union view, most employers refuse to accept the concept of a "well-rounded worker." A union leader, echoing many similar comments, claimed that "employers don't want to empower workers; they don't even want to empower their own managers."

We were also told that employers are more frightened of change than are the workers—"Even their personnel departments don't know what the printers are doing. In negotiations they make poor decisions . . . decisions that benefit neither the workers nor the employers."

The union leaders argue that in the long run, the union orientation toward training would produce fewer work rules and a more adaptive workforce. A union leader offered three "examples":

1. In the New York City area there is no training school. The union runs the hiring system, and the newspaper workforce is very task-specific. There is no cross training. Each specialty guards its workers, and when cutbacks occur, workers in specific areas must be fired. No flexibility exists.

2. In areas with training schools, the workers are less fearful of new technology. Union schools create a positive view toward new technology and change: "Schools are the key to the breakdown of fears about technology for an area."

"Lithographers," for example, "have the oldest training schools and the litho guys are most adaptive, can best roll with the punches."

3. Employers do not want to pay for training or cross training. The journeymen are not paid for additional training. The apprentices, of course, get more money when their training is completed, but no workers are given released time to attend the schools. All courses must be offered before or after the shifts.

Union leaders assert that local GCIU training centers improve the overall quality of the workforce. The schools train many workers from different firms. Employers thus benefit from an improvement of the total pool of workers. Union spokespersons consistently claimed that with all but a few enlightened employers, competition and lack of trust dominates their approach to training. Union leaders often noted the "poaching" hypothesis, which claims that employers resist worker training because the trained workers will be hired away by another firm—"they try to steal each other's trained workers." Employers do not look to long-term self-interest, just the short term. If enlightened, they would push for training and cross training."

Unions claim that management is fearful of a well-rounded workforce, is usually too focused on the short term to promote training, is concerned that training will invite higher wage workers into jobs that are paying less, may be resistant to training workers who will be "stolen" by other firms, and resents supporting the union-backed training center structure.

Union leaders say that "our model works: We've worked out the bugs, and the government should help." They argue that training is best left in the hands of the union because union-run schools reassure members and students, and that union members make the best teachers. They point out that at the International Labor Organization (world labor) meeting, union people from throughout the world seek GCIU help for training systems. Moreover, foreign students and scholars who attend union training schools are consistently impressed. The union leaders claim that "we could also help kids from the U.S. but we get no outside support."

Although they see the schools as fundamentally sound, they argue for two improvements. First, they would like to see more government funding to assist the schools and reduce the burden on the employers. They would particularly seek government help for providing capital equipment. Second, they believe that the schools would be strengthened if there were more employers involved with the work and curriculum of the schools.

The Management View

Management generally rejects any argument that there are advantages to union control over vocational training in the industry and certainly does not perceive GCIU's schools as leading the effort to instill industry-wide training perspectives. In contrast to the reports of organized labor, the employers contend that the unions are the ones who seek to maintain old task classifications and related training systems—maintaining work organization that has been made inappropriate by new computer technologies which cut across traditional tasks. Employer representatives, using words very similar to their labor counterparts, assert that the new technologies require workers to understand the overall range of tasks, that the process itself has radically changed and is becoming an integrated operation. Management stresses its commitment to cross training and to the use of technology to enhance a plant-wide appreciation of operations. They see labor as reluctant or unable to change.

Employer association representatives acknowledge that they are trying to "starve the GCIU schools to death" via reductions in contributions. Some employers suggest that training would be more efficient if the number of GCIU schools were reduced from the current seventeen to three. The schools, they indicate, should centralize by specialty. Eventually, we are told, the employers may wish to abandon schools entirely, and rely on their own training programs, high schools, community colleges, and vendor training. The employers' association spokespersons noted that the GCIU Chicago school is the best in the nation and yet does not have state-of-the-art equipment on which to train.

Thus, employers point to training by equipment vendors and industry associations as alternatives to the GCIU schools. But, as we argued in the previous section of the report, neither of these sources of training have emphasized broad-based training and education designed to impart knowledge about AAI. Industry association training focuses primarily on managers and higher level workers, but to the extent that either vendors or associations train workers, the training addresses short-term and specific problems, rather, than attempting to build broad bases of knowledge and competence.

Management does argue that some of its in-house programs serve an integrative function within the plant—especially when they involve computer technology or its increasing efforts at cross training. But few deny the disparity between the ardor for an industry-wide training perspective and its absence in the field. Employers accept that the industry faces real but poorly understood threats: the role of electronic publishing (e.g., video catalogs, interactive digital newspapers, e-mail), the increasing importance of plateless printing (e.g., laser printers), the long-awaited paperless office (including electronic invoicing), new office technologies (e.g., integrated fax, copiers, digitizers, and personal computers), improved and powerful forms of desktop publishing, growing environmental restrictions, and electronic transmission of text to printers anywhere on the globe. These unknowns portend fundamental shifts in the graphic communications industry. Some employers are seeking to capture parts of the new markets or technologies (e.g., electronic catalogs) but the essence of these phenomena is that most are located within the offices of the customers, not at a central source such as a printshop or newspaper.

PIA leaders also suggest that in the future firms will be "less defined by geography." Firms will use electronic pre-press capable of sending information to a distant plant. Local printers, especially those with high wage workforces, will face national competition. The protection of time and travel will be reduced. Large firms, in particular, will establish satellite plants to capture smaller markets. The message from this employer association is that unionized plants will be under greater pressure to lower wages.

Thus, employers do not see these looming problems as reasons to strengthen their relationships to the representatives of their workers. On the contrary, employers are seeking to exclude the unionized workers from emerging jobs. This perspective is ultimately based on the notion that there will be a massive turnover in the industry workforce. The solutions to the industry problems will not come from retraining the current workforce but rather from a combination of new technology and a new workforce. The new workforce will not necessarily be less skilled, but it will not learn its skills through the traditional means. Whatever the actual benefits of the GCIU schools, their links to the unions mean that most employers do not see them as part of the emerging system.

The example of the GCIU schools clearly show how training, especially longer-term oriented training, is thwarted by the continued conflict between management and the unions. As we have argued, the structure of the union-schools gives them many advantages as sites for broader training. But the conflict leads to stalemate. The unions are trying to maintain workforce levels in the face of rapid technological development, much of it aimed at reducing the labor component. The union also sees itself as the guardian of skilled and honored crafts. Crafts that employers increasingly view as expensive and better replaced by technology and less skilled labor. Many employers also view the GCIU training schools as moribund or at least as vestigial and expensive. Certainly, they have little desire to participate in innovative curricular change with institutions they prefer did not exist.

In the end, the schools can only operate effectively with the cooperation of both sides. Although employers can be required to pay the training fee, assuming that the union gets it into the contract, they can create numerous problems such as inflexibility in scheduling. Perhaps the greatest problem concerns the schools' reliance on the firms for equipment. As a result, the schools have to teach their students using old technology. For example, the Washington school has neither new presses nor up-to-date scanning equipment on which to teach. The desktop publishing computers are relatively modern but are in short supply and are not the industry standard.

All of these currents and crosscurrents take place in the real world of shop production demands, of a desire to avoid costly conflict, of emerging technology with dramatic labor-saving potential, of uncertain markets, and of a difficult if not perilous landscape for labor. Locked in their places, neither union nor management thinks it has the latitude or strategic position to institute the changes both claim are needed.

In this environment, the future of these schools looks bleak. This is reflected in the remarkable modesty of the director of the Washington school in his statement of the school's mission. He said that the school's mission is "to teach skills that will allow people to keep jobs." He added that this would best be accomplished by teaching desktop publishing, electronics, and the use of new presses and new printing processes. Ironically, the schools limited capital equipment prevents it from accomplishing even those modest goals.

Conclusion

Here we return to the three broad barriers identified in the previous section of the report. We suggested that organizational innovation and associated broader training was thwarted by weaknesses in the educational systems that prepare workers for the industry, the urgency of day-to-day production needs, and the strength of traditional divisions and categories that would be threatened by the new strategy. The example of the GCIU schools illustrates the interaction of these issues.

The traditional apprenticeship structure of the schools was very much occupationally oriented. Even today, despite stated enthusiasm for broad training, the curriculum makes virtually no concessions to a new approach. Nevertheless, the potential for change could be there if the unions and the employers could cooperate. Indeed, the structure of the schools that could maintain close links with the workplaces and that are funded collectively by all participating employers, could offer a solution to the problems caused by the short-term demands of production. But ultimately, the conflict between union and management appears to be closing off this strategy as a solution to the emerging training and educational needs of the industry.

DON BOSCO TECHNICAL INSTITUTE

Introduction

So far we have emphasized the problems that confront organizational innovation in the printing industry and the broader training that might accompany it. One of the problems is that few of the educational institutions that serve the industry have adjusted their programs and curricula to build a broader base of knowledge and competence.

In this section we describe the Don Bosco Technical Institute, a school in southern California with a strong graphic arts program that has successfully transformed its program. A forward-looking leadership, close ties to the dynamic local industry, as well as perhaps some unique aspects of the school itself are factors that have allowed this school to make progress while some others have not. Nevertheless, despite considerable progress, the school has faced significant problems in broadening its program—similar to some of the broader barriers that we have outlined earlier.

We first describe the environment in which the school is located in order to understand whether the economic and demographic forces that influence the school are similar to those forces acting nationally. We then describe the school and its programs and end with a discussion of the factors that might explain the path that this institution has taken.

The Setting

The printing industry in California rode the long wave of post-war economic expansion to establish itself as the nation's largest concentration of printers. Notwithstanding the area's off-center location, making it an unattractive locale for book and magazine publishers shipping to a nationwide clientele, California experienced a steady growth in printing employment. Most of the state's printers are found in southern California, where the bulk of the state's population and employment is to be found.

While the printing industry is alive and well in southern California, this is not so for its educational and training system. As we have noted, the advent of new printing processes have transformed the industry and the technological revolution is not only going strong, but picking up speed. This is particularly true in California where the industry has enjoyed above average growth in the last decade. Technological change has done more than upset the industry's traditional structure of skills; it has also undermined the institutions on which the industry relied for the training and transmission of skills.

The union apprenticeship system has traditionally played an important role in printing training. Earlier, we described the decline of the GCIU training schools, but this process is farther advanced in southern California. As one union leader told us,

> There was a [GCIU] school here in L.A. that's just been closed. The unions decided to stop funding (since they were) training twenty people a year for jobs that were no longer germane to industry at great expense. We could have sent them to Harvard.

The rapid pace of technological change complicated the school's mission. In comments similar to those we heard in Washington, one union official noted that "the employers felt that training in the plant on the job was more worthwhile than in a class." With the advent of technology, it was hard for the schools to keep pace." In the end, the schools succumbed to "conflict over the bang for the buck." As even the union leaders admitted, "there's no point training people for a trade that no longer exists."

Notwithstanding the schools' demise, apprenticeship lives on. But given the withered state of the unionized sector, it can play only a limited role in adding to the industry's supply of new blood. And what persists is a limited apprenticeship for which collective agreements with the remaining union printers provide a small amount of funding.

Though important, the union schools and apprenticeship programs were only one source of skilled labor. Printers could also learn their skills through the vocational education system; L.A. Trade Tech, profiled in the apparel section of this report, is only one of many secondary and postsecondary educational institutions that have long provided vocational education in printing. But in southern California, vocational education in printing, like the union training institutions, no longer adequately plays its former role. Technological change is again part of the problem. As an education specialist with the southern California branch of PIA complained, "What has happened is that education hasn't caught up. Some schools still talk about hot type." The disparity between industry needs and vocational education practices have left the high schools particularly hard hit as the following shows:

> We're finding that in Graphic Arts, education in the traditional high school shop program is slipping by the wayside. There are not many programs left; an awful lot of programs have disappeared. Rightfully so. They're not stimulating people to go into the industry.

The community college system appears to be doing better: a number of local community colleges, most notably, L.A. Trade Tech and Pasadena Community College, maintain active printing programs. But the typical community college program seems to reflect the needs of the industry as it previously was, not as it is currently developing. Thus, the following are typical programs in which students can acquire a degree in a single occupational specialization: graphic arts composition, presswork, or photo offset. The programs provide relatively little overlap among these different specializations. For example, the presswork associate's program at one college requires students to take only one course from either of the other two specializations. And some of the courses appear to involve instruction in techniques—for example, stripping—that will soon be obsolete, if they are not already so.

Thus, the traditional training institutions are no longer adequate, but no satisfactory alternative has yet emerged. Union officials, not surprisingly, lamented the demise of training, commenting that "without apprenticeship, if people haven't gotten into a well-rounded trade school, they're stuck in a box. When technology changes, they have nothing." But management appeared equally unhappy with the state of the training system. Given the industry's fragmentation—with many, small, highly specialized employers—printers had no ready mechanism for developing a new corps of skilled labor. With a "very mobile labor force," there are few incentives for employers to invest in training. As one management representative noted, "Employers say they train people and then the people leave. Historically employers stole skilled workers."

Consequently, the industry is beginning to exhaust its supply of labor. As one progressive employer with a commitment to training noted, "The labor shortage is projected, but we're already feeling it. In our industry, apprenticeship is dead. There's nothing to say whether a pressman has good experience or not."

Thus, the situation in southern California appears to be a somewhat exaggerated version of the national picture—faster growth, newer technology, and more rapid demise of the traditional training system. And the emergence of a new training and education system seems to be just as difficult in California as it is elsewhere.

Nevertheless, there are signs of progress. The Don Bosco Technical Institute has been able to surmount some of the difficulties that plague the rest of the training system in the region. Don Bosco is a Catholic school offering both a high school and associate's degree. Our informants in the industry identified this as the highest quality training institution in the area. The case study indeed suggests that Don Bosco is an exemplary school, but the characteristics that make Don Bosco exemplary highlight the barriers that thwart similar developments in the rest of the industry's training system.

Graphic Arts Education at Don Bosco Tech

The Don Bosco Technical Institute, located just east of downtown Los Angeles in the San Gabriel Valley, is one of many such institutes run by the Salesian order worldwide and named after St. John Bosco. This particular school was established almost forty years ago in the city of Rosemead. It occupies a large, well-maintained campus, where vocational and academic programs are housed in clusters of buildings that stand opposite one another—symbolizing the traditional separation of vocational and academic programs. Don Bosco's program begins in the ninth grade; it provides both a high school degree for those students seeking to continue on to the University of California and an associate's degree for those students seeking either to work after graduation or continue on in the California State University system.

Don Bosco's student body is highly diverse, reflecting its proximity to Los Angeles' new immigrant and ethnic concentrations. Situated just east of heavily Chicano East Los Angeles and in the middle of the increasingly Asian San Gabriel Valley, the school's student body is about 70% Hispanic and 30% Asian, with the proportion of Asians steadily increasing as the Asian population in the San Gabriel Valley grows. Students come from all over the San Gabriel Valley and beyond, though most live within a ten mile radius of the school. About half of the students are graduates of Catholic elementary schools, with the remainder coming from the public system. As there are no funds for recruitment, the school advertises through churches and by word of mouth. In addition, the institute's worldwide presence is an additional source of information for prospective students. There are many Don Boscos in the Philippines, and not surprisingly, a steady stream of students from Los Angeles' growing Filipino population attends Don Bosco Tech.

Don Bosco's student pool is selected on the basis of academic and financial ability. Admission mainly occurs at the end of eighth grade, although a small percentage of students enter at the end of ninth grade. Prospective students take an entrance exam; Don Bosco admits all those who score at the 50% level or above; those scoring between the fortieth and fiftieth percentiles are referred to an admissions committee. Tuition is currently $3,700 a year, a relatively modest sum by private school standards but a hefty amount from any point of view as it rivals tuition at the University of California. Fees and entrance requirements notwithstanding, Don Bosco has "no problem getting students" and September 1992 saw the entrance of its largest freshman class ever. There appears to be a sufficiently large population capable of and motivated to pay the tuition. For those families with economic difficulties, the school offers an array of scholarship and after-school work opportunities. "It is very rare," say school officials, "that students would be denied admission or kicked out because of lack of financial ability."

Don Bosco retains about 75% of the students who enroll. Students who drop out tend to do so after ninth grade: In some cases, students decide that they are not technologically oriented after all; in other cases, they are placed into a different technological specialization than the one they desire. For the less motivated students, the school's demanding environment may also be a problem. "It's an all boy school. A long day. Kids can go to Holiday High School and play with girls."

Faculty

Don Bosco's staff numbers eighty teachers, split roughly in half between technology and academic faculties. Priests account for only a small proportion of the total teaching staff. Alumni comprise the biggest source of faculty, especially in the technology division:

> We prefer to hire a guy with an associate's degree from here. Make him a TA. Then we arrange a schedule for him to finish (the B.A.) at Cal State. Then when he finishes the degree, he comes in as a regular teacher.

The preference for alumni, especially among technology teachers, stems from a variety of factors. One consideration is technical preparation: whereas prospective teachers with an industry background may be most familiar with a particular cutting-edge technology, they seem to have too narrow a knowledge base. Moreover, Don Bosco can and does make successful efforts to keep its staff abreast of new developments in the workplace. The school maintains a close working relationship with industry through its advisory board. These arrangements, to be discussed at greater length below, permit faculty to retrain themselves through short-term work experience. For example, one faculty in the printing program spent the summer of 1992 working at the firm of one of the school's advisory committee members. As an indicator of the school's commitment to training and retraining its instructional personnel, Don Bosco is "paying (his summer) salary so that we don't lose him." In addition, departments provide financial assistance for people to join technological societies and organizations and instructors are regularly sent to seminars and conventions.

Curriculum

Students enter Don Bosco Tech in the ninth grade. At this time they begin a rigorous program of academic studies, while rotating among the seven different technological specializations offered at the school. At the end of ninth grade, students choose the technology in which they wish to specialize; the selection is a competitive process, and not all students enter the area they prefer. Construction is the most popular area, with graphic arts (officially known as graphics communications technology) ranking two or three. Specializations last for either three or four years, depending on whether students graduate from high school or continue on to the associate's degree. The fourth year of high school is the honors program; most courses are designated as honors or advanced placement courses. Those students who stay at the Institute enter the college program, in which they complete 38 units of academic coursework and 24 units in a technology major, like graphics communications.

The transformation of Don Bosco's printing program dates back to 1980, when the school's current Dean of Technology became chair of the printing department. Up until then, the program had maintained a traditional occupational orientation, with a structure similar to that still in place in the community colleges: "The idea was that students would leave and be a press operator or stripper, etc. I realized that we weren't providing the right training."

Though the school coupled classroom instruction with a cooperative education program, in which students would spend a semester working in an employer's shop, even that arrangement was difficult to maintain, as employers were increasingly reluctant to accept interns. Consequently, printing was the least popular of all the school's technologies, "ending up with the student that no one else would take."

By contrast, the program now strives to develop generalists, doing so in a way that closely reflects the new thinking about production methods and organization in manufacturing. "We try to tell kids they need to have an overview. I can't see someone starting as a stripper without knowing how to run a press." The goal of molding generalists rather than specialists is also more consistent with students' postgraduate careers. Most go on to college; and those who begin employment after obtaining the associate's degree start work on a track that usually leads to management. Preparing students for careers in management rather than skilled labor increases the importance of understanding the process as a whole, since "this is the type of thinking that management does."

The new approach has improved the program's standing. While construction remains the most popular, printing ranks two or three among the school's other programs. The students with whom we spoke informed us that "this shop is probably the most liked, except for construction. None of us dislike it. We do the work and like it." As a result, the program has the highest retention rate of all of the technological areas in the school.

Innovation has taken several forms. First, there is a new curriculum. The old specializations have been eliminated, so that all students take courses in color separation, stripping, and press. The printing program has also added new courses in design, plant management, and estimating, with units that reflect the latest trends in production thinking—a quality control class, a "what if?" class—and an emphasis on the use of computers wherever possible (e.g., in estimating).

Second, the curriculum has been brought up-to-date in technological terms. Here, the key change involves the introduction of Macintosh computers (Macs) and an emphasis on desktop publishing:

> I knew about Macs, but at the time we introduced them, they cost four to five thousand (dollars) a piece. One day the school's president was showing a foundation rep around, and the guy said that he'd like to give the school some money. We got ten thousand. That was the beginning of the Mac lab. I had an old typesetting machine—a varitype machine that used to cost five thousand just for servicing. I just threw it out.

Students now spend about one third of the time in the high school program using Macs: "That was unheard of five years ago."

Third, the program emphasizes conceptualization over memorization, a logical change reflecting the new emphasis on developing generalists rather than specialists. As the Technology Dean, himself a graduate of the printing program, reflected: "We used to make kids memorize a lot. It terrorizes me to think about the time I wasted. The information was just useless. It wasted their time. They could have been learning more generalizable things."

The emphasis on conceptual skills is felt in all areas of instruction, yielding changes in pedagogy, course organization, student study habits, and interactions among students and between students and teachers. Courses increasingly seek to teach theory, highlighting master concepts and underlining relationships among concepts in different technological domains: "The key concept here is emulsion. We show how this thing—what you're doing with this flat—relates to what's going on in the press later on."

An emphasis on principles has led to the development of new courses, for example, one on the scientific basis of Graphic Arts, which serves as a capstone course for those students completing the AA degree. Courses like these not only seek to integrate the different specializations within printing, but to highlight the commonalties between printing and other manufacturing industries. Thus, a class in printing management focuses on subjects like quality control or statistical process control.

The shift in concern from "fewer facts, more relationships" also alters the learning and studying process. Instead of memorization, classes engage students in problem-solving: "How do we look at dot gain from the camera, in contact frame, when we make plate, etc.? All of those areas can change dot size. How can we change the problem?" Instead of encouraging individual achievement and competition, instructors are trying to implement cooperative learning. Here, there is a conscious effort to mimic advanced practices in industry, in particular, quality circles. To prepare students for what they will encounter after graduation, instructors try to get students to see one another as resources: "We don't answer questions unless students first ask members of their team."

Similarly, the program emphasizes "not what (the students) know but whether they know how to find it." Consequently, instructors require students to prepare notebooks, which are compendia of the material and information they acquire in class. Students are allowed, indeed encouraged, to use their notebooks on exams: "Kids who do well in preparing their notebooks ace their tests." A related emphasis involves teaching students the skill of learning on their own, and imparting the habit of doing so. The idea that after graduation "students will have to (learn) on their own," shaped teaching practices in desktop publishing—rather than giving lectures, instructors assisted students as they went through tutorials.

But the new pedagogical approach is demanding for the students; therefore, some faculty believe that their ability to select students makes their job easier—this has implications for diffusion of the model. Clearly, contact and involvement with new technology and computers provide a source of excitement for students. As one student told us in describing the program, "I like color, design, where you design the image on the computer and then go to color. All of the equipment is fun to work with." The students with whom we spoke, though just a very small sample, were clearly very computer-oriented, with one an active user of his own Mac, and the other shopping to buy his own. But if exposure to technology excites students, it also requires higher-level skills and types of thinking—which means harder work: "Kids have problems with going up to higher levels of thinking. Not easy to do that. I have to tell them why. What the purpose is. Overall, it has worked."

Teaching and Technology: The Balancing Act

The staff of the printing program at Don Bosco has tried to stay abreast of technological change. But doing so is a severe challenge. On the one hand, the pace of change is extraordinarily rapid, with new equipment and processes constantly being introduced, often involving costly machinery far beyond the school's ability to pay: "The biggest problem is that in order to teach all the things (we want), we don't have enough money. We need to buy a multicolor press, for example, and it doesn't look as if anyone will donate one."

On the other hand, the pace of change in the industries' workplaces is extraordinarily uneven, reflecting the fragmented nature of this highly diverse industry. Many firms, especially smaller ones, have only partially adapted the new techniques, and in many instances, may not be aware of new developments.

> Many systems are getting to the point where they will eliminate the camera. This will happen by the end of the century. The pre-press area is being revolutionized. Heidelberg (a major press manufacturer) showed a direct imaging process. You compose on Mac and then hang blank plate on the press. The press has an imaging system, so that as it turns it exposes plate. You eliminate stripping, proofing, and camera making. If we were to put that machine in the school we would be ahead of the industry.

But if Don Bosco is not able to obtain equipment that would put it in front of the industry, balancing the imperatives of staying up-to-date with the everyday needs of today's printing firms presents a conflict that the school can negotiate only with difficulty.

The impetus for technological upgrading comes from the relationships forged with firms on the school's advisory board, about which more later. For the moment, the crucial point is that these leading firms have been a catalyst for change, encouraging the school to develop its desktop publishing course and to implement new processes and equipment: "Several years ago, the board said to do away with paste-ups and we did. We have a machine that exposes daylight-handling film. We obtained this machine as soon as we knew about it, because of the advisory board."

But such a responsive approach to technological change has exposed the school and its graduates to the technology's uneven diffusion through the industry. Though Don Bosco students now learn about the process described in the paragraph above, they "graduate and go to plants where they wouldn't know about it." Similarly, the advisory board suggested that the school do away with teaching students how to develop film by hand. Contrary to the sense among leading firms that "no one does that in the industry," some employers still do. "So smaller companies complained that our kids don't know how to do trays."

How to cope with the uneven pace of technological change does not seem to be a problem unique to printing; but it clearly hits printing with special force because the industry is so heavily dominated by small firms that have great difficulty adopting cutting-edge processes. Unevenness poses particularly sharp pedagogical issues for a vocational school, which both wants to be attuned to the needs of today's employers—so that graduates can be placed—while also imparting those skills that will be needed over the long haul. The problem is conceptualized by the staff as "Do we teach people what they need to know now or what they'll need in five years?" As one teacher stated, "Something has to go." At Don Bosco, what has gone is the old technology. "With all this change, if you're going to adapt, you're going to leave behind some older skills that people will value." But since resources are also constrained, even an attitude of technological responsiveness does not yield a totally satisfactory outcome. "Either we're ahead or behind. There are state-of-the-art companies who are ahead. And small companies who are behind."

Linkages to Industry

Linkages to industry have been a vital part of the modernization of Don Bosco's printing program. The key event was the development of a long-lasting connection to the southern California branch of PIA, initiated by the current Dean of Technology in the early 1980s. An advisory board, including PIA, was first formed in 1983. And members of the printing advisory board now sit on the school's advisory board as well.

PIA has been an active force in encouraging the school to move away from an occupational specialization, to adopt new technology, to work out a more satisfactory system of cooperative education. PIA and other employers were influential in persuading the top school leadership to go along with the changes implemented in the printing industry. Industry connections have also been crucial in the school's effort to get up-to-date technology: "The key has been improving relationships with people in industry. We got equipment donations. One donation led to others. Once employers see the value of what the kids are doing they're responsive."

As noted earlier, members of the advisory board also play a key role in helping staff keep abreast of new developments in technology. Don Bosco regularly pays faculty for summer work at an advisory committee member's firm.

Conclusion

The printing program at Don Bosco Technical Institute is clearly an exemplary case, the story of a vocational program that has been overhauled in ways that bring it close to the practices of today's progressive manufacturers. The program has broken away from the narrow, occupational orientation of traditional vocational education programs in this field; learning focuses on conceptualization and group-oriented learning, and lifelong techniques of learning; and the program has implemented a curriculum that not only integrates different printing specializations, but broader manufacturing processes as well. The postgraduate activities of its graduates signal the success of the approach—almost all of the students either go on to more education or find jobs in the industry, often ending up in management positions.

But these changes have occurred under very specific circumstances. A close look at the conditions of change at Don Bosco suggest that the options for the broad array of vocational programs in printing may be more circumscribed.

First, Don Bosco begins with the advantage of an environment in which the orientations and attitudes of faculty, parents, and students are quite closely matched. Clearly, there is an important community effect: Don Bosco is a Catholic school, and many, though by no means all, of its students are Catholic. Networks, not just church-related affiliations, further tie Don Bosco to its students. Students are recruited through word of mouth. Instructors, as noted earlier, are drawn from the ranks of alumni. These connections breed a sense of affinity, which is consciously encouraged by Don Bosco administrators who emphasize that the personal relationships between the faculty and the kids is "more important than the technology." Selectivity also comes into play: Only those families willing to bear a substantial financial sacrifice will send their children to Don Bosco. And academic selectivity not only bars less qualified, more difficult to manage students, but makes possible the demanding program that has been developed for graphic arts: "Academic and technological performance are clearly related. Technology is applied academics. You can't do well in technology class if you can't read, write, or calculate."

Selectivity also helps in effecting relationships with employers, who view Don Bosco graduates in a very positive light. This conclusion does not necessarily mean that AAI would be impossible without this type of selectivity. Indeed, AAI advocates argue that the strategy is superior to traditional approaches for motivating and teaching students who are not among the more successful academically. Nevertheless, the staff believes that their ability to select students facilitates their successful development of a more innovative curriculum and pedagogy.

Second, in a related factor, Don Bosco probably enjoys some flexibility in its curriculum because so many of its graduates are headed for more education and ultimately for management jobs. And traditionally, employers have seen an important role for broader training to managers.

Third, as a private school, Don Bosco has a much more flexible structure, where responsibility for decision-making rests at the director's door. Consequently, new ideas can be more easily implemented. Of course, negotiations and internal politics remain part of the innovation process. But the key factor is that the decision-making is internal and influenced by long-standing relationships among people who are part of a community.

In terms of the central barriers to broader training that we outlined earlier, the staff at Don Bosco is not blocked from their innovative plans because those innovations might threaten traditional divisions and categorizations. As we have argued, this was a fundamental cause of the weakening of the GCIU schools.

But even Don Bosco must face problems associated with the speed of technological change and the day-to-day production needs of the diverse printing community that hires the school's graduates. Keeping up with current technology is difficult, but even more complex is the problem of training students for the future of the industry when they will be hired by firms firmly anchored in the present, or even the past.

The staff at Don Bosco appears to have made the decision that they will give up something in terms of the immediate preparedness of their graduates in order to provide a broader and more comprehensive education. If an education that teaches AAI seems to be a luxury for many schools and firms, it is a luxury that Don Bosco appears to be able to afford. The structure and history of the school insulates it from many of the problems that thwart other educational institutions.

THE APPAREL INDUSTRY

Introduction

At the end of the 1980s, the apparel industry employed a healthy segment of the American workforce with about one million apparel workers located throughout the United States. Between 1973 and 1985, the apparel import market share rose from 27.7% to 48% with three-quarters of that increase taking place in the 1980s (American Textile Manufacturers Institute [ATMI], 1986). In the four years following 1985, apparel imports rose from 5.2 million to 6.7 million square yard equivalents.

Unfortunately, these figures tend to mask grave industry problems which existed during the same time period. During the decade following 1977, annual labor productivity growth in the industry was only 2.4%, while productivity in the manufacturing sector as a whole grew by 3.1% a year (ATMI, 1990), although the labor productivity of U.S. producers remained above productivity for the country's major competitors (Rothstein 1989). Employment in the industry fell by 18% during the same period (ATMI, 1990). The falling employment and growing import penetration took place despite declining real wages and significant import protection. Between 1980 and 1985, average apparel wages dropped from 75% to just over 50% of average manufacturing wages (Office of Technology Assessment [OTA], 1987, p. 7).

Apparel production is still dominated by operators pushing material through sewing machines. As a result, it is difficult to think of apparel manufacturing as a mass production process or what we referred to as a traditional process in the introduction. Indeed Piore and Sabel (1984, p. 118) refer to the women's-wear sector as a craft industry. Certainly, the increasing frequency of annual or biannual style changes in women's wear have influenced the work process, and some producers still concentrate on customized production using highly skilled craft workers. Nevertheless, apparel production in many segments has mass production characteristics, and traditional apparel manufacturing has little in common with the transformed workplace model. The industry still maintains a sharp separation between workers and managers, and even today, many industry managers focus their efforts on rationalizing the production process in classic Taylorist fashion. These managers believe that the competitive basis of the industry depends on the creativity of the designers and on the ability of the managers to engineer the work process. Managers seek low wage workers and there are virtually no educational requirements for the large majority of operators. Traditionally, the industry drew on newly arrived immigrants or a domestic rural labor force. In both cases, the industry represented a first step in industrial employment. Immigrants continue to provide a crucial source of labor for the industry in many areas (Waldinger, 1986).

Moreover, despite style change in some segments, much of the industry produced runs of thousands of dozens of basic or standardized commodities such as jeans and men's trousers, underwear, sweatshirts, socks and hose, and men's shirts. For example, by the end of the 1970s, the pattern for Levi's bestselling 501 jeans had received only minor modifications since it was first introduced in the early 1880s (Brooks, 1979). The design of men's white shirts hardly changed for decades and changes in the design of standard tee shirts and men's underwear are rare. To be sure, there were segments such as *haute* *couture* and some types of women's wear in which styles changed more rapidly, but even women's-wear makers had long lead times and rarely produced small orders.[7] In any case, it was in the basics and less style-sensitive segments where U.S. industry maintained its competitive edge.[8]

But changes in apparel markets are reducing the demand for the types of garments that can be produced using the mass production model.[9] Fashion seasons have started to proliferate. Liz Claiborne, for example, now uses six seasons—Pre-Spring, Spring One, Spring Two, Fall One, Fall Two, and Holiday. Even within seasons, retailers want constantly changing merchandise. And fashion consciousness has now spread to lower priced markets. Industry analysts expect that the current twenty percent market share of commodity products such as men's underwear and socks that are sold all year will continue to fall.[10] Moreover, basic garments come in many more styles and colors than previously. Denim can be bought in hundreds of weaves, colors, and finishes.

In response to these market changes, most apparel producers in the United States have increased the number of styles that they are producing and have reduced the length of production runs. With one exception, all of the plants that we visited were producing more, often many times more, styles or stock-keeping units (SKUs)[11] than they were ten years previously (only one plant had cut the SKUs in the last five years).[12]

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[7] For example, a women's sweater producer in Queens pointed out that traditionally he started working on the September deliveries in February. Moreover, even for women's wear, contractors often produced tens of thousands of each item. For example, in 1988, a Liz Claiborne contractor in New York City still produced typical orders of twenty or thirty thousand pieces.

[8] There is some evidence that imports tend to be higher in most fashion-oriented sectors. For example, consumers who want to be on the cutting edge of fashion generally turn to Italian designers. At a more general level, imports tend to be higher for women's clothes than for men's (although domestic dress production remains very strong). Within women's clothing, slacks and shorts, which are more standardized, are still predominantly produced in the United States, while well over half of women's shirts and blouses consumed in the United States are produced abroad (American Apparel Manufacturers Association [AAMA], 1988, Table 3).

[9] One indication of the increasing change and uncertainty in apparel markets is the increase in markdowns and stockouts. Markdowns are necessary when retailers fail to sell items during the appropriate season. But since styles now become obsolete much more rapidly, forced markdowns have increased by 50% during the last decade. Losses from stockouts, which occur when retailers run out of hot items, amount to 8% of sales (OTA, 1987, pp. 26-27).

[10] In 1982, shipments by makers of men's wear, children's wear, and underwear, which tend to be less affected by style change, totaled about $22 billion. Shipments totaled about $21 billion for the more style-oriented sectors that made women's wear, furs, hats, and miscellaneous apparel and accessories (U.S. Bureau of the Census, 1982). But this is a very rough estimate and there is wide variation within each of these subsectors. Based on interviews with industry marketing specialists, OTA (1987) estimated in 1987 that about 35% of the market was accounted for by "fashion" items that had a 10-week life, 45% by "seasonal" items with a 20-week life, and 20% by "basic" items that are sold throughout the year (p. 16).

Market changes have also provided the impetus for apparel producers to try to reduce the time that it takes to design, produce, and deliver goods. If domestic producers can deliver on tighter schedules, retailers can wait longer to place an order and have more chances to reorder hot items before the fashion season ends: Frequent style changes and greater variety and uncertainty in apparel markets increase the advantages of fast delivery times, therefore making physical proximity to the U.S. market an important competitive advantage for domestic producers, assuming they can produce on short notice.

Since the mid-1980s, some leading textile and apparel producers have developed the "Quick Response" strategy to reduce production times. This involves better communications (especially electronic data interchange) between retailers and producers, better inventory tracking, and some innovations in the production processes. Some industry analysts argue that the lower inventory levels, lower risks, and faster inventory turnaround made possible by Quick Response could save enough to compensate for a 25% to 35% differential in the wholesale price between domestic-and foreign-produced apparel (Kurt Salmon Associates, 1988, p. 13).

Thus, the industry has begun to place much greater emphasis on flexibility, inventory levels, and production cycle times. This has implications both for internal factory organization as well as relationships among firms in the supply chain. Both of these in turn could relate intimately with the breadth of skills needed by operators, supervisors, managers, auxiliary personnel (such as designers and marketers), and other occupations.

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[11] One SKU is a particular color/style/size combination.

[12] For example, a sleepwear manufacturer had increased the number of styles he produced from 100 in the mid-1970s to over 300 in 1988. Previously he had shipped 90% by truckload and 10% by United Parcel Service (UPS). In 1988, 99% of his shipments were via UPS. He typically had $5 to $6 million in inventory but by 1988, he rarely had as much as $2 million, even at the peak season. Another producer of men's slacks and shirts said that his average cutting size had fallen from 100 to 150 in 1980 to 40 in 1988. He also said that he sent out orders through UPS as small as one or two items. A formal men's wear producer had increased the number of styles from 12 to 90 between 1978 and 1988. For a women's intimate-wear maker in the Midwest, SKU's had quadrupled in ten years. Textile producers also point out that their orders from apparel makers are much smaller, causing their plants to produce more styles (Bailey, 1988, Chapter 2).

Internal Factory Organization

According to AAMA (1988), "Manufacturing executives in the sewn products industry have traditionally spent their careers maximizing the output of individual operators" (p. 11). The focus on the individual operator, as in many manufacturing industries, was made possible by the accumulation of buffer inventories at every stage of production. This allows managers to rationalize each step separately and prevents, within limits, problems in one stage of production from disrupting the other stages.

In apparel, the buffer inventories are stored in "bundles" of about 30 cut garment parts. The operator takes a bundle and performs one task, which often takes only a few seconds such as sewing a hem, attaching a pocket, or joining a front panel of a shirt to the back. When the operator has performed her task on the thirty pieces in the bundle, she processes a work ticket (which is the basis of her piece work payments), reties the bundle, and begins work on another. In the plants that we visited, operators had between one and one-half and eight hours of work waiting for them.

The bundle system increases individual productivity, but it requires a tremendous amount of in-process inventory. The production of men's suits for example, is broken down into more than one hundred operations. Each operator usually has two bundles waiting at her station for processing; thus, at any given time, there are thousands of garment pieces sitting in bundles on the factory floor. Factories producing a garment requiring about twenty standard minutes of labor typically accumulate between 15 and 20 days of work-in-progress in this process (AAMA, 1988, p. 12). Thus, the bundle system ties up capital in inventory, complicates quality control,[13] lengthens throughput time, and blocks fast response to market shifts. As a result, the bundle system has come under pressure as apparel markets have changed and as U.S. producers search for potential sources of comparative advantage.

Innovative Techniques in Workplace Organization

Finding that technology and tighter management alone cannot bring about a more responsive and flexible production system, managers have now turned to experimentation with organizational innovation. The technique that comes closest to more participatory work reorganization is referred to as the module system.[14] In modules, groups of operators work together to assemble an entire garment. After each operator completes her task, she passes each piece or garment directly to the next operator. Thus, modules drastically reduce in-process inventory, and for many garments it only takes a few hours for a given piece to go through the production line.

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[13] Defective work can accumulate in the buffer inventories for long periods without being detected.

Although the actual sewing tasks carried out by workers in modules do not differ from the tasks performed by bundle or Unit Production System (UPS) workers, the module system requires important changes in the industry's human resource practices. Supervisors and engineers can no longer focus on workers in isolation but must consider the effect of the action of each worker and the design of each task on the contemporaneous functioning of the group. Workers must become involved in the quality and pace of production of their coworkers. If one operator falls behind, then another group member will help her catch up. In well-functioning modules, any imbalances in the production process will be corrected in this way without any intervention by the supervisor. This requires some of the operators to be able to do a variety of tasks.

Machine maintenance and repair are much more important in modules than in the bundle system since a machine breakdown can quickly stop work for the entire group. In some cases, the mechanics are also members of the module. Similarly, operators are sometimes given instruction in some of the basics of machine maintenance and repair so that they can either repair small problems or at least have some sense of the cause of the problem when a mechanic arrives to correct it.

In some modules we observed, group members had input in setting the group goals and deciding how they will be met. Managers in more interactive settings often place a good deal of emphasis on developing a team spirit and encourage the groups to take responsibility for the amount and quality of the output.[15] Peer pressure plays an important role. For example, a worker in one plant often skipped her lunch hour in order to keep up with her group. Every manager who had tried modules argued that peer pressure tended to result in lower absenteeism.

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[14] For descriptions of the module system, see AAMA (1988). Five of the thirteen firms that we studied for this project had sewing module pilot projects.

[15] If the group is responsible for the quality, each worker in effect inspects the previously completed procedures. As a result errors are corrected immediately. With the bundle system, operators have no incentive to notice or to do anything about quality problems from earlier operations. Indeed, taking time to point out upstream quality problems would actually reduce an individual's piece rate income. Not only does the group as a whole pay more attention to quality, but the individual members feel pressure from the group to avoid errors since everyone is affected.

With the elimination of buffer inventories, problems at one stage of the process will rapidly spread to others. The module system is premised on a group solution to these problems—mutual assistance among the work group. Since the production in this configuration is a group effort, piece rates must be abandoned. Operators are usually paid a straight hourly rate or an hourly rate with a group bonus.

With the shift in focus from the individual to the group, management of the interactions among the members of the group becomes a fundamental determinant of the strength of the module approach. Thus, modular configurations require a high degree of communication and cooperation among the operators, the mechanics, and supervisors.[16] This type of activity is completely absent in a traditional bundle plant. And since group cohesion and the nature of personal interactions are so important, the typical thirty percent annual turnover rates among operators becomes a greater barrier to successful operation.

Industrial Structure

The needs of flexibility, quality, and speed have implications for the relationships among firms in the overall supply line for a product. If a producer is to be able to turn out a variety of goods quickly without large inventories of supplies, that producer's suppliers must also be able to deliver high quality inputs just as quickly, whether they are manufactured items or services. One approach entails large firms spinning off departments to serve as independent contractors—this is sometimes referred to as quasi disintegration. Similarly, smaller firms in the supply chain, rather than maintaining arms-length, market-mediated relationships to customer and supplier firms, must work out partnership arrangements in which they share information on demand and innovations and coordinate their production.[17] A key to this strategy is close cooperation among the firms within the network. If this is successful, each firm can enjoy the advantages of a coordinated and responsive supply pipeline while concentrating on its function within that process, without being assailed with the problems of capacity utilization and balance that plague larger, vertically integrated organizations.

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[16] The training director of one firm that had module pilot projects at several factories emphasized that the single most important factor in the relative success of the projects had to do with how the team dealt with its slower members. For example, while most of the groups had increased productivity after switching from the bundle system, the productivity of one group that produced pants had actually declined. Sharp resentments developed against the slower members because they were holding down the team production, while the slower members resented the hostility of their colleagues. The dynamics of group interaction are a powerful force in the behavior of the team, yet those dynamics can develop in constructive or destructive channels. In dealing with these problems, there is tremendous potential for the development of antagonism and hostility within the group. This is a particular problem in factories where the workforce includes members from many ethnic groups.

The apparel/textile complex offers a particularly dramatic example of this development. Some analysts have attributed the success of some sectors of these industries in Japan and Italy to their use of producer networks (Dore, 1986; Piore & Sabel, 1984). In the United States in the last several years, large apparel and textile employers have tried to develop closer relationships to suppliers and customers. These relationships now include computerized links to facilitate ordering and minimize inventory. In general, whether through backward or forward integration or through the development of subcontracting partnerships, the traditional vertical structure of the apparel/textile complex is blurring. More and more, large department store chains are deeply involved with apparel and soft goods production, while garment producers themselves have moved into direct retailing, Benetton being the best-known example. Whatever the particular institutional form, there is now much more interaction among firms (or departments and divisions in the case of integrated operations) up and down the supply chain. One important implication is that more employees within each firm or division will interact with employees in other firms or divisions. Closer links between firms at different levels of the supply chain also require greater understanding within each firm of the problems and objectives of other firms in the network.[18] In a classic example, shop-floor machine operators from one spinning plant met periodically with equipment and raw material suppliers as well as customers to discuss problems and improvements.

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[17] See Jacquemin (1988, pp. 150-151). Of course, it is possible to develop close relationships with contractors without actually arranging them. For a discussion of this development, see Johnston and Lawrence (1988).

[18] The problem of vertical integration versus network in the structure of the industry has its analogy in the relationships between employers and employees. Given the increasing uncertainty and change, firms want to maintain flexibility and are therefore reluctant to make long-term commitments to individuals. Many firms have turned increasingly to temporary or contract workers.

Work Organization and Training in Apparel

So far we have argued that economic forces affecting the industry have encouraged innovations in work organization as well as in relationships among firms in the industry. Executives from many of the best known firms in the industries such as Arrow Shirt, Levi's, Hanes, Milliken, Hart Marx, and many others have started programs in organizational innovation, reform of supplier relations, and Quick Response in general. Employer associations such as the American Apparel Manufacturers Association and the American Textile Manufacturers Institute (ATMI) have been enthusiastic promoters of Quick Response and related efforts. Furthermore, during the last several years, articles appear constantly in widely read industry publications such as *Bobbin*, *Women's Wear Daily*, and *Textile World*, reporting on companies that have improved their performance through the use of these innovations.

Nevertheless, there is evidence that the spread of innovation in the internal organization of production in the textile and apparel industries is slower than expected. Most progress in Quick Response has involved improved communication among firms rather than significant reorganization of the production process itself. A 1992 survey of 1,000 textile and apparel production facilities (with a 65% response rate) indicated that less than 15% of the apparel firms were using modules or other innovative techniques. The large majority of firms still used piece rates, rather than group incentives of hourly pay—compensation systems more consistent with Quick Response-related process innovation. In 1992, 75% of all apparel firms still believed that their production worker had adequate education and only a small share believed that their mechanics needed more education. Most firms simply provide no formal training, although many do have an informal system in which a supervisor will help out new operators until they pick up the skills. New operators are often simply put into production immediately, working on simple operations. When piece rates are in use, these beginners are not expected to produce their targets for several weeks, and are therefore paid by the hour until they are up to speed.[19]

Therefore so far within firms, the progress towards innovation in the internal organization of apparel firms has been slow. Industry leaders continue to speak enthusiastically about module systems and Quick Response and indeed firms continue to innovate and experiment, but the majority of firms have maintained a traditional system.

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[19] These are from as yet unpublished data from a survey by Thomas Bailey.

Similarly, apparel firms are a long way from making a significant commitment to broader training for their production workers. Training, when it takes place at all, is still narrowly focused.

What accounts for the slow pace of reform? One way to answer this question is to examine the underlying determinants of organizational innovation in the industry. Different sectors of the industry are more likely to try modules or unit production systems than others. For example, the AAMA estimates that the bundle system is still superior for producing products such as basic western jeans which have no style changes and can be made with a good deal of mechanization, while modules appear to be best for dresses, which have frequent style changes and several annual fashion seasons. These estimates suggest the importance of basic economic factors—style change, fill-in needs, and typical length of run.

On the other hand, certainly apparel makers in New York and Los Angeles, tend to achieve production flexibility through using the skills and labor market flexibility of an immigrant workforce (Waldinger, 1986). An immigrant labor force not only apparently offers cheaper labor (and perhaps reduces the pressure to innovate), but ethnically heterogeneous workforces can complicate the operation of modules. As the manager of a men's wear plant in Philadelphia argued, "In my factory, I have Muslims and Hindus who won't talk to each other. How can I expect them to work together in a module?"

Ethnic and gender differences between managers and operators are yet another barrier to organizational innovation based on breaking down the distinctions and barriers between workers and their managers and supervisors. In many sectors of the industry, white managers supervise immigrant or native minority workers, and in the vast majority of apparel plants, the managers are men and the operators women. These differences may reduce management's willingness to share power and authority.

Also at this early stage of experimentation in organizational innovation, large modern firms such as Arrow and Russell Athletics are more likely to try modules or teamwork than smaller more traditional firms, even though the smaller firms may be serving more variable and fast-changing markets. The larger firms are more likely to contact with consultants, foreign producers, and the employer organizations who have experience with new techniques for organizing production. Extreme financial pressure may also thwart innovation in work organization. Given the absence of auxiliary institutions and traditions that support workplace innovation, larger firms with adequate financial resources or those that are particularly committed to change are most likely to carry out significant workplace reform.

It is instructive to look at the foreign experience with production process innovation in apparel. Japanese-style work reform seems to have proved itself in the auto industry, but little Japanese apparel is sold in the U.S. In 1988, Japanese garment makers accounted for only 1% of the U.S. imports (down from 35% in 1964) (AAMA, 1988). Moreover, the Japanese apparel industry is itself not based on the "Japanese" system of lifetime employment. Rather, traditionally most sewing machine operators are young women who work for a few years before they marry. Bundles still cover the floors of most Japanese apparel plants.

There is some research that demonstrates the advantages of the German system. The Germans have had most success in the high end of the market where the production runs are only a few hundred pieces. The key to their success appears to be tight management, not innovative work organization. One study of the German industry pointed out that production schedules in Germany were "invariably" met. This resulted from "accurate estimates for machining [sewing] times (based on garment engineering techniques whereby every sewing operation is broken down into as many as 20 pretimed movements)" (Steedman & Wagner, 1989, p. 47). This sounds like Taylorism. In any case, the Germans have had little success in the U.S. market, and 60% of their domestic consumption is imported, compared to about 50% for the U.S. (AAMA, 1988; Steedman & Wagner, 1989).

Italian apparel makers have had success in the U.S. To some extent, this tends to be at the upper end of the market, for example in men's suits. Italian knitwear makers such as Benetton have also been successful in broader market segments. But the success of Benetton appears to derive from its ability to coordinate many subcontractors, its sophisticated application of technology, its designing ability, and its innovative marketing and retailing system (Belussi, 1986). In any case, internal factory work reform does not appear to be a significant force. One report cited in Belussi (1986) pointed out that most of Benetton's labor intensive work was performed by subcontractors and that labor productivity in subcontracting firms was higher for labor intensive functions. This higher productivity of contractors was a result of the "higher working pace and higher worker control that is exerted there [in the outside shops]" (p. 33). Thus, innovative work reform has made only slow progress even in other countries that seem to have institutions and traditions that are more supportive of work reform.

Countries with abundant cheap labor are still the major source of imports. In 1988, Taiwan, Korea, Hong Kong, and China accounted for 53% of U.S. imports while a list of developing countries accounted for an additional 28% (AAMA, 1988). The prospects for much greater trade with Mexico resulting form a North American Free Trade Agreement have encouraged even some of the most innovative producers to look to Mexico for cheap labor rather than make significant investments in restructuring their U.S. production (Bailey & Eicher, 1992).

Educational Preparation for Production Workers

Previously, we argued that, in general, the educational institutions that serve the printing industry are themselves not providing broad-based training. At least when it comes to preparation for production workers, this is certainly true in the apparel industry as well. Below we discuss two educational programs. The experience of these programs, which are considered among the best in the industry, illustrates the difficulties of developing innovative, broad-based programs for production workers in this industry.

TC^2

The Textile/Clothing Technology Corporation (TC^2) was started in the early 1980s by apparel firms and unions with help from the federal government as an attempt to develop labor-saving automation for the apparel industry. Over the following decade, its objectives evolved from this technological focus to an emphasis on education, technological diffusion, and experimentation with flexible manufacturing work organizations. Located in Raleigh, North Carolina, and supported by the industries' unions, many of the leading manufacturers, as well as some of the most influential consultants, TC^2 is a focal point for many of the most promising organizational innovations in apparel. The headquarters building has a functioning demonstration factory where manufacturers can visit, observe, and even try modular and other new techniques. TC^2 has also been deeply involved with attempts to strengthen the communication between textile producers, apparel makers, and retailers. The organization's staff also recognizes the role that education must play in the development of innovative approaches. Thus, it has a large and growing educational program.

For example, the 1992 course catalog includes hands-on seminars in modular manufacturing, computer fundamentals, ergonomics, facilities planning, material utilization, quick response, methods engineering, total quality management, and others. These courses take one to three days and are also used in TC^2's internship program in which students in apparel production programs attend a ten-week course of study which includes participation in most of the short seminars. Interns or managers who attend several of these seminars are sure to get a broad understanding of the production of apparel with a particular emphasis on organizational and technological innovations.

To begin with, except for programs geared toward sewing machine technicians, which will be discussed below, the TC^2 educational program is directed at managers and future managers, thus it has little opportunity to directly broaden the training of production workers. Furthermore, the program is entirely production oriented. Little formal attention is paid to the connections between production and marketing, design, retail systems, or other nonproduction factors. TC^2 emphasizes that they do not want to compete with universities or other trainers and that they therefore stick to the areas in which they have a comparative advantage. It is, therefore, unlikely that managers will look to TC^2 to learn about marketing. Thus, from the point of view of the organization, the demand for broader courses may not be there. Nevertheless, it is significant that an organization which represents the cutting edge of organizational innovation in the industry has not made explicit connections to other aspects of the industry.

TC^2 does have an extensive program for training sewing machine mechanics, but this is very narrowly focused on the skills needed to maintain and repair particular pieces of equipment. Indeed, the program consists of a series of high-quality interactive video instructional packages designed to teach students about particular models and brands of sewing machines. Thus, while the program obviously teaches important and necessary information, there is little emphasis on underlying theory or broader aspects of the production process, to say nothing of an orientation towards all aspects of the industry (AAI).

Thus, from one point of view, while the TC^2 programs are oriented towards organizational innovation in the industry, their educational services are narrowly focused on production issues. The programs for nonmanagers, primarily mechanics, are even narrower. Ironically, this does not reflect an overall narrow perspective on the part of the TC^2 faculty and leadership. Indeed, they are committed to a vision of the industry with much greater interaction up and down the supply chain as well as among the industry's various segments. But time and money are scarce. Managers and workers who attend seminars are not on the job. When the costs of training become so obvious, broader training with more amorphous or even theoretical seeming benefits appear to be a luxury.

The Apparel Program at El Paso Community College

El Paso has traditionally been a manufacturing city and an apparel production center, specializing in more or less standardized items such as trousers. Levi Strauss and Company have several plants in the city. But apparel employment may be threatened by competition from Mexico as the effects of the North American Free Trade agreement take hold. In 1990, Farrah, the trousers maker, closed a plant employing several hundred workers and moved across the Rio Grande to Ciudad Juarez.

In response to both the problems and opportunities presented by expanding trade with Mexico, the El Paso government and some of the educational institutions in the city have developed a variety of programs to support and strengthen the regional manufacturing sector. One program that has received enthusiastic support from the local business community is the Advanced Technology Center (ATC) at El Paso Community College. The mission of the ATC is "to promote the economic development of the El Paso/Juarez region by offering technical assistance, technology infusion, research commercialization, technology transfer, and a broad spectrum of competency-based education and training."[20] Thus, the ATC promotes new technology and provides the training needed to implement and use it. It offers training both to employed workers in need of upgrading and unemployed workers, who have often been displaced when factories have moved across the border. Thus, the project is built on a progressive model of integrated training and technological diffusion and upgrading.

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[20] Unpublished material provided by the ATC.

The Apparel Project is one of the newer programs at the ATC. About 60% of the students are employed workers sent by their firms for upgrading and the remaining 40% are experienced but displaced apparel workers. The project has four courses:

1. *Computerized Marker Making and Pattern Grading* (120 hours): "This course provides the hands-on experience needed to make an efficient transition from manual to high performance computerized marker making and pattern grading."

2. *Advanced Industrial Sewing Machine Repair* (160 hours): "Designed to train experienced, conventional industrial sewing machine mechanics in the operation, adjustment, and repair of programmable, industrial sewing machines."

3. *Computerized Front Office Systems* (160 hours): "Designed to cross train the student in several areas of integrated business systems including order entry, piecework payroll, and inventory systems."

4. *Advanced Industrial Sewing* (3 sections, 50 hours each): "Industrial sewers will progress through all facets involved in programming and operating computerized industrial sewing machines."

The curriculum design does emphasize cross-training and the courses include material to broaden the knowledge of the students. For example, the sewing machine operators learn preventive maintenance and simple troubleshooting. Mechanics are taught how operators earn their money from piece rates so they understand why the operators are upset when the machine breaks down. They try to teach the pattern graders the principals of design so that they can make adjustments as sizes change because standard "rules" of grading do not always work. The resulting grading problems are often only caught much later after some fabric had already been cut or sewn. This is now more of a problem as changes are happening much more rapidly. Also, it is now possible to see a representation of the finished garment based on the graded pattern. If the pattern representation does not look right, a good grader could change it. The program's staff has also found that experienced operators often do well in the office systems program. A great deal of this program has to do with piece rate related payroll where someone who has been working on piece rates would have less trouble understanding the procedures.

About 90% of the unemployed students find work after their training and several local employers have been active on the advisory board. The Apparel Project has worked closely with Levi's in particular on a variety of upgrading and literacy training programs.

But all employers are not convinced about the need for broader training. One resisted the notion that operators should learn simple troubleshooting and machine repair and another asked that patternmakers not be taught how to program the underlying code. That employer was concerned about possible sabotage by the workers if they knew too much. Furthermore, with some notable exceptions such as Levi's, innovative organizational techniques such as sewing modules and other types of teamwork, have so far not been widely adopted in El Paso. Therefore, employer demand for broadly trained workers who might be most effective in transformed workplaces has not been especially strong.

As in the case of TC^2, the Apparel Project at the ATC in El Paso is run by staff who understand the rationale for broader training, and the entire ATC is based on a forward-looking model of integrated training and technological diffusion, with very close ties to local businesses. Furthermore, as a result of the proximity to Mexico, the employers in the city have a strong incentive to adapt to the needs of the future and at the same time enjoy a strong local economy that has in general benefited from increasing trade with Mexico. Thus, the environment would seem to be conducive to innovative training approaches, and indeed the Apparel Project does emphasize modern technology and does teach students something about the jobs of other workers in the factories.

But despite the advantageous circumstances, the movement towards AAI training is limited, extending to only those aspects that are most proximate to the tasks or occupations in question. To be sure, these are courses with very immediate goals. Employer support for new directions in training is tentative. In the El Paso apparel context, broad training seems to be more important for the workers who will have more options in the labor market if they are displaced, than for employers who want broadly trained personnel for transformed factories. Indeed, as we have seen, employers sometimes resist broader training.

Thus, the program illustrates the tradeoffs that confront educational innovators committed to broadening their curricula. The benefits of AAI training appear amorphous and can be expected only over the long term. Especially in high pressure circumstances and programs closely coordinated with the workplace, it is easy to see significant curriculum reform as a good idea that can wait.

For production workers, the benefits of broader training appear to be low. The situation in this industry has many similarities to that in printing. The immediate production needs in a highly competitive market and the presence of traditional barriers and divisions in the industry and its workforce militate against the investment that would be needed for the spread of training for all aspects of the firms or plant, to say nothing of AAI. The continuing need for large amounts of repetitive manual labor combined with gender and sometimes ethnic differences make it difficult to bring about a more unified production or training structure.

Nonproduction Occupations

Despite technological and organizational change, apparel production jobs continue to require extensive repetition of routine tasks. It is reasonable to argue that as long as most seams must be sewn by an individual sewer operating an individual machine, organizational innovation involving production level workers will be limited. What chance does a sewing machine operator have to use knowledge about other aspects of the industry if she or he must repeat the same task hundreds of times a day?

But perhaps a better case can be made for broader training of nonproduction workers involved in design, distribution, communications, or merchandising. Furthermore, while it is likely that production jobs will continue to move abroad, especially with trade liberalization, these nonproduction functions will remain in the U.S. Firms that produce in Mexico, for example, still maintain offices with many auxiliary functions in New York, Los Angeles, or other U.S. apparel centers. Some industry experts stress that the future of U.S.-based apparel and textile firms will be based on their skill as designers, organizers, and marketers much more than their manufacturing prowess. Thus, while demand for AAI education for operators is not yet strong, such training is becoming increasingly important for the technical, service, and administrative personnel both in the plants as well as in the industry's headquarters, design, and distributions centers.

In order to focus on training for nonproduction jobs, we now turn to a case study of two growing and successful associate's degree programs. The programs are successful in the sense that enrollments are rising and that employers clamor for the graduates of the programs. One program trains fashion designers and the other, fashion merchandisers. Design and merchandising are closely related, and these would be areas in which we might expect to see attempts to integrate the curricula. We might also expect to see curriculum reform that would strengthen the students' understanding of production. This is particularly true for design students.

VOCATIONAL EDUCATION IN FASHION DESIGN AND MERCHANDISING: LOS ANGELES TRADE AND TECHNICAL COLLEGE AND NEW YORK'S FASHION INSTITUTE OF TECHNOLOGY

Los Angeles Trade and Technical College

The Setting

Over the past twenty years, Los Angeles has emerged as the epicenter of the nation's most dynamic regional garment industry. Whereas garment employment has been declining in its original northeastern concentration for several decades and in the past ten years began to erode in southern states as well, the clothing industry has been on a steady upswing in southern California. Like New York, Los Angeles is a major fashion and design center; but unlike its eastern counterpart, Los Angeles is home to a large and buoyant production sector as well.

Apparel's growth has been paralleled by an even greater expansion of the retailing sector. Southern California's extraordinary population growth, combined with high incomes, have made the region highly attractive to many of the nation's major retail chains.

In contrast to almost every other state, apparel employment in California grew during the 1980s. Furthermore, the expansion of apparel and retail activities in southern California is reflected in the educational sector. Courses in fashion design and merchandising are offered in many of the numerous schools in the large community college sector. Several colleges, in addition to the one profiled in this case, have well-developed programs offering students an opportunity to acquire extensive competencies. The community colleges are not the only players on the scene; there are numerous private institutions that exercise a significant role as feeders of trained personnel.

But although the industry complex and its educational complement are alive and well in southern California, the characteristics of the industries and of the educational sector have reinforced the traditional, occupational-orientation of vocational education in this field. In California, as in the rest of the country, organizational reform in apparel production has been slow in coming. In most respects, California's producers have hewed to the industry's traditional strategy of fragmentation in firm structure and work organization.

At the same time, the demographic changes that have spurred apparel and retail growth in the region have proven compatible with this more traditional organizational structure. Immigration has been the chief source of California's population growth, and few industries have been as dependent on immigrants as apparel. The immigrant presence in apparel is most pronounced on the factory floor, but it is by no means limited to the ranks of sewing workers. Immigrants comprise an increasing proportion of contractors and even manufacturers; as we shall see in the case study, they are increasingly permeating the industry's technical cadre as well. The immigrant penetration is most easily absorbed within a structure that maintains the traditional pattern of fragmentation. The immigrant population moving into the garment industry is itself highly diverse and to a significant extent occupies distinctive ethnic niches. Moreover, the industry's fragmentation is indeed a permissive factor of the massive immigrant entry. It is precisely because demands for higher-level knowledge and communication skills are relatively low that newcomers can move into and move ahead in this industry in such numbers.

Thus, there is a fit between the industrial environment and the traditional thrust of occupational training for the industry. The local industry has not demanded a significant broadening of the curricula. Education for the fashion industry has indeed prospered in this region, but within a traditional occupational focus. The case that follows focuses on the region's oldest and most important public training institution in the fashion design field: Los Angeles Trade and Technical College.

Fashion Education at L.A. Trade Tech

History

Though the fashion programs comprise only two of the more than sixty specializations offered at Los Angeles Trade and Technical College, fashion is the nucleus out of which today's L.A. Trade and Technical College actually developed. The roots go back to 1920, when the Los Angeles City Board of Education established its first vocational venture as a course in power sewing. Shortly afterwards, this initial effort led to the establishment of the city's first vocational high school, the Frank Wiggins Trade School. After World War II, the school embarked on a new mission, as course offerings were extended beyond high school levels, and postsecondary efforts became the focal point. L.A. Trade Tech has been a junior college since 1949 and it is now one of nine junior colleges in the Los Angeles Community College District.

Bolstered by its proximity to the city's flourishing garment industry, as the oldest fashion program L.A. Trade Tech has long played an important role in training the industry's technical, managerial, and entrepreneurial cadre. The school's alumni are well-represented in the industry, and many of the instructors are themselves L.A. Trade Tech graduates.

The Fashion Merchandising Program, established in 1983, substantially strengthened L.A. Trade Tech's role in fashion education in the Los Angeles area. Historically, the school's course offerings had been in the fashion design area. In general, fashion merchandising was an underdeveloped educational field; few colleges offered specific courses in the area, as careers in fashion merchandising were viewed as byproducts of an initial training in marketing. However, L.A. Trade Tech took the view that fashion merchandising was a viable academic program which could lead to real career opportunities for students with strong fashion interests but weaker design abilities. Consequently, a fashion merchandising program was added to the design program in 1983, with one additional full-time line provided for a fashion merchandising instructor and remaining instructional needs furnished through hiring of part-timers.

Institutional Characteristics

Institutional characteristics are among the defining features of the fashion programs at L.A. Trade Tech. Fashion courses are found in many community colleges in southern

California, but they are invariably housed within a home economics program. By contrast, fashion is a separate program at L.A. Trade Tech, reflecting the college's origins as a provider of vocational education in the needle trades. Fashion Design and Fashion Merchandising are housed within a single department. This institutional distinctiveness has allowed the fashion programs to build resources and develop specialization independently. The college offers more dedicated hours in fashion instruction than any other two- or four-year public college in the state.

Finances

The enrollment-based financing patterns of California's community college system tend to discourage change and innovation. Financing patterns are a holdover from the time before the colleges were spun off from the high schools, a fact reflected in the requirement that each class begin with the taking of roll. In this context, the fashion design and merchandising programs have grown on the strength of their impressive enrollment figures. The programs enjoy very high weekly student contact hours (WSCH) per full-time equivalent, with a WSCH/FTE ratio of 499 for the college as a whole in comparison to 625 for fashion design.

Programming has evolved under the influence of the particularities of the funding situation. Thus, in the fashion design program, class enrollments are designed to maximize resources available to the crucial lab classes for daytime students. Mandatory morning lecture classes have the highest possible enrollments; similarly, evening classes are taught with multiple levels, and contain as many as fifty students. High enrollments in morning and evening periods drive up WSCH, allowing for smaller classes in laboratory-type courses, in which the most important training occurs.

One hazard of enrollment-driven systems is an understandably cautious attitude toward change: Should a newly developed course fail to draw students, the lower WSCH exercises an immediate impact. As the program's former dean indicated, "our funding peculiarities mean that it is a big deal when we take over a class."

Students

Number and Characteristics

As of fall 1991, L.A. Trade Tech was suffering from a surfeit of students, who were heading for the community college system in unprecedented numbers, a development that reflected both bad economic times and restricted access in the state college system, which has raised tuition and cut classes. Overall, college-wide enrollment was up 6.95% in the fall of 1991 compared with the fall of 1990, and enrollment in the fashion programs has run even further ahead, maintaining the traditional pattern.

The fashion programs essentially run on two tracks—during the days, for full-time students, and at night and Saturdays, for part-timers. The daytime fashion program enrolls 340 to 400 students, while about 200 are enrolled in the daytime merchandising component. The evening and Saturday programs contain about 900 to 1,000 individual class entries, making it the largest evening/Saturday program on campus.

As with the other components of the community college system, the fashion programs run on an open admissions basis, taking in all comers, regardless of prior vocational or academic skill or performance. "Students come in with suggested pre-requisites," noted the programs' former dean, "but you can't say 'you can't come in at all.'" Open admission attracts a population that is highly varied in terms of ethnicity, age, and prior experience and education.

At the college level, the ethnic distribution reflects the diversity of southern California: 11% of the students are Anglo, 42% are Latino, 33% are black, and 14% are Asian. While the merchandising students reflect the college population, the complexion of the design students is quite different. Design is much more heavily immigrant, with a significant Asian tilt. While Hispanics comprise the largest ethnic group in design, they account for barely 29% of enrollment; Asians make up another 25%, Anglos 16%, blacks 13%, and Pacific Islanders 11%. The immigrant presence can be seen from another dimension, as a substantial number of the students, especially in the fashion design program, obtained their high school degrees abroad. For many of the students, similarly, English is not the primary language; once again, the immigrant presence is seen more strongly in design, where only half of the daytime students are "primary" English speakers, in contrast to 76% in merchandising.[21]

Whereas the immigrants, especially those who migrated as adults, are particularly likely to come from an industrial background, a substantial portion of the entering students have no prior exposure to the industry at all. As the programs' former Dean noted, "We get a lot of people who are changing careers. Many have had one career before. Many felt that they can do fashion from the time they're little, but repress the idea until adulthood."

While both programs have a varied student body, they draw from somewhat different populations. Design, as will be discussed at greater length below, has a more strictly vocational orientation and therefore tends to attract a larger proportion of immigrants and students with English-language deficiencies. By contrast, merchandising is a more academic program, and the field itself demands people who are comfortable in an environment where verbal interchange is a must. Consequently, it attracts a higher proportion of students with native or good English-language proficiency. As the programs' former Dean said, "In merchandising the students' communication skills have to be at a higher level. The students tend to be lively, aggressive, people-oriented. The design students are more willing to work with their hands."

Students also differ somewhat between the evening and the day. The evening students are almost all employed, tend to be five to ten years older, and are more likely to be foreign-born.

Consequences of Diversity and Accessibility

Diversity and accessibility have pedagogical consequences for both the design and merchandising programs. Elementary algebra and an English course in intermediate composition are the *recommended* prerequisites for the first two design courses. Students who score below a specified level on the national college entrance exam, which they are required to take, are then recommended to take these classes. However, as the former

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[21] This is data for fall 1991 daytime students, kindly supplied to me by Sharon Tate, Dean for Academic Affairs, L.A. Trade Tech. The ethnic composition among evening students in the fashion design program would be somewhat different, with a greater preponderance of Latinos and smaller shares of Asians and Anglos.

Dean stated, "they can tell us no. While we strongly suggest that they get remedial help as they go through the program, we wouldn't make it a bar."

Some students, especially in the design program, enter with virtually no English-language facility. "I have two Russians who speak virtually no English," noted the instructor of a draping class. "But they're A students." While many design students have basic English proficiency, "diversity leads teachers to instruct as visually as possible." Even with requirements for basic English, some instructors felt that students entered the design program without the necessary level of proficiency. One design instructor commented that

> The hardest part of teaching here is the fact that standards have become lower because of the English problems. Sometimes, they can't even understand what you're saying. Usually, though, there are other students who can translate. If you try to give standard information on paper, they may not assimilate it.[22]

For the design students, it is basic math, not English, that provides the basic intellectual foundation for training.

> We find that literally because what we're dealing with is abstract geometric shapes, if students can't measure they have a problem. Usually, this is not a foreign student. This is a conceptual problem. Our typical profile of the foreign student is someone who comes in with the highest math and the lowest English.

Students also enter with an extraordinary range of vocational and academic skills, as this sketching teacher in the design program noted: "Some students come with a commercial art background. Lots of Asians have sewing backgrounds. But others have never been on sewing machines. I've had nurses in my classes."

In the design program, students with little prior exposure will often discover that they have no aptitude for the field; in other instances, students who had never sewed a stitch before discover that "they have the touch."

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[22] Our own sense, based on class visits and conversations with students, is that such extreme problems with English comprehension are not that common. While there are many foreign students, those that we observed and talked with, during day classes at least, were proficient in day-to-day English. Nonetheless, the quote is an important indicator of the difficulties involved in teaching a non-native-speaking population, whose numbers, both relative and absolute, will only increase in the future.

With students so disparate in skills and training, teachers grapple with the problem of how to place the level of instruction:

> There's always a big difference between the best and the worst students. It's hard to reach an average point. If you go too slow, the best ones leave.
>
> I always have to find the midpoint between students who are UCLA graduates and those who don't even know what an eighth of an inch is.

As noted below, the pragmatic, work-oriented nature of instruction at L.A. Trade Tech provides a workable strategy for managing the diverse skill backgrounds of the students enrolled in the fashion programs.

Curriculum—Course Requirements

The design and merchandising programs vary considerably in structure and requirements. The design program is a tightly organized, highly vocational program. The great bulk of the hours required for either the certificate or the degree is devoted to a sequence of skills training courses which all students undergo. At any time in the program, students are spending twenty-two hours in class, of which twenty are devoted to lab classes. The program assumes no or little prior sewing knowledge; therefore, students begin with lab courses that emphasize basics such as clothing construction and basic fashion art and design. By the second year, students move on to patternmaking, design, and manufacturing production. These lab classes are highly condensed, requiring considerable discipline and high student commitment. For example, the initial clothing construction course assigns ten projects, a midterm, and a final; by the end of the nine-week course, students will have produced a fairly complex garment, as in the case of the class we observed, a child's lined jacket.

In addition to the fundamental lab classes, students also take elective classes on such subjects as fashion history, construction of yarns and fibers, and basic fit problems which are taught lecture-style. First year students must take two out of three possible electives; second year students can choose from a broader array of courses.

By contrast, the merchandising program allows for much greater choice, offers a more traditionally academic program, and is less time-intensive, as students spend only sixteen hours in class per semester. Entering students must choose between two broad options—(1) merchandising, which allows for further specialization into merchandising, fashion journalism and promotion, and personnel management in the second year and (2) visual merchandising display. In the first year, all merchandising students essentially take the same courses—merchandising areas, design, and other fields such as marketing or math. By the second year, students can then choose among the three broad options listed above; these choices will often involve a substantial amount of coursework in other departments, especially in the fashion promotion/journalism and personnel fields. Students in the visual merchandising/display option mainly take courses offered by the fashion merchandising, fashion design, and vocational art programs. In general, the merchandising option is the most popular, receiving about 40% of enrollment, followed by journalism/promotion with 30%, visual merchandising with 20%, and personnel with 10%.

Course curricula are determined at a departmental level. While the same course may be taught by different instructors, each course has certain pre-specified objectives which all instructors must attain. However, the instructors have considerable latitude to determine just how they will reach their instructional courses.

Although both design and merchandising programs can lead to an associate's degree, design students are much less likely to pursue this option and more apt to graduate with a certificate or even to begin working once basic technical skills have been acquired. By contrast, the merchandising students are more likely to get the associate's degree. As the director of the merchandising program noted, "The only ones who don't (complete the degree) are those who already have them. You can't get anywhere (in retail) without an AA degree."

Skills and Pedagogy

Basic Skills

Both design and merchandising programs require "basic" skills, but the content of those basic skills varies between the programs, reflecting the relative importance of vocational as opposed to academic instruction in the two programs. While the basic academic skills required in the design program are of the most elementary sort, these skills are not necessarily universally possessed. "I was shocked to learn that I had to teach the ruler," noted one design instructor. A similar comment was registered by the instructor in a class where students learn how to grade, or size patterns, who noted that "The most difficult part for the student is measurement and working with the ruler, doing the basic arithmetic that this involves."

Students' skill deficiencies lead to problems in the teaching of the lecture courses on such topics as fashion history or twentieth century designers, which are crucial for providing students with a repertoire of designs on which they can draw in the future. The most basic problem is that "most students don't know how to take notes. They can't write in general: this deficiency becomes very apparent." Writing difficulties make it difficult for instructors to determine how to design appropriate assignments. One instructor explained that "I don't have them write papers. I just ask them to do a sketch adapting historical clothes to modern-day clothes." Another contented herself with one-paragraph descriptions about each designer.

Though inadequate literacy and numeracy skills are apparent among some portion of the design students, they seem to have only a marginal impact on basic technical training, where visual and manual competencies are of paramount importance. By contrast, students needed a stronger foundation in the basic skills for the merchandising program, given its more academic orientation as well as the requirements of merchandising careers. For example, fashion communications, a required course for the merchandising, fashion promotion/journalism, and personnel options, functions essentially as a basic writing course, taught with a fashion slant. Similarly, all merchandising students are required to take a math class with a section specifically designed for them. Classes also have a strong interactive component, which is congruent with the requirements of merchandising work. As one instructor noted, "I want them to increase their communication skills; this is even more important in the fashion business, where miscues and poor communication skills cause mistakes. What is the meaning of what is very, very important."

Pedagogy

Vocational considerations influence pedagogical strategies in both the design and merchandising programs. Depending on the nature of the skill being taught, instruction may be purely oriented toward principles, or may teach principles within a clearly applied context.

One example of principle-oriented instruction in the design program is the sketching class, a basic course that students take in their first semester. In this class, the instructor's approach is to

> place the emphasis on getting students to interpret their own ideas. It's not so much of an illustration class. I work with formulas that break down the figure. I start with a picture of the figure and then let the students work with it. After learning the figure, then they start turning it. Next they zero in on areas of the body, learn the principles of shading, and from there start to concentrate on the head, details of the head, so that they become familiar with proportions and at the same time learn how to use the pencil, how to get light and dark areas with the same pencil.

The fashion communications course, part of the merchandising sequence, takes a mixed approach. To a considerable extent, the focus is on writing principles that are common to writing of all types. In a class we attended, the instructor reviewed an assignment in writing a personality profile/feature article. She began with a discussion of how to write a lead sentence, reminding students that the idea of a lead "is to tease your readers and startle your readers into reading more."

While the skills component of this lesson could have been transplanted to almost any classroom, the fashion communications instructor strived to orient the lesson toward the specific occupational context. After reviewing the mechanics of a lead, she turned to discussing preparation of a press kit. A press kit, she reminded the students, is one of the basic tools of a public relations (PR) person: "What do PR people do? They're pesky people, trying to promote their clients, get whatever coverage they can. In fashion this is a new thing. Sometimes they're paid on a retainer basis or else in house."

The crux of the discussion focused on marketing issues:

> How can a PR specialist keep his clients from ending in an editor's trash can? An editor is usually apt to throw material in a garbage can. The best PR people understand where an editor's coming from. The folder should project the image of the designer. But remember that a folder is expensive and that your profit is what's left after costs. The profit goes down as the costs of the kit goes up. In fashion, the more interesting designers are, the flakier they are, the more interesting and fancy kits they'll want, and the less they'll want to pay. This is one of the problems with fashion PR.

The patternmaking course provides another variant of the mixture of principle-and vocationally-oriented pedagogy. On the one hand, patternmaking requires a high level of technical proficiency. But on the other hand, those proficiencies have to be used in a context where economics and very pragmatic organizational considerations have a major effect on design decisions. Thus, the instructor continually referred to her class as "this factory," with statements to the effect that

> In this factory, we identify pieces [with a symbol on the pattern]; in other words, this is the front of the skirt, this is the back of the skirt, and so on.
>
> We will put a code number on each piece because if the pattern piece falls on the factory floor, the cutter might not know which garment it belongs to without the code.
>
> Do you know what happens to small pieces or add-ons? You trace them on the back of the largest piece. They can disappear otherwise and that costs a lot of money.

In all of these examples and throughout the class, the instructor reminded the students that what they were hearing was based on her own practical experience.

Vocational concerns affect assignments as well as teaching practices. For example, in the following statement the instructor of a merchandising class, a part-timer who is a partner in a garment manufacturing firm, told her class that their next assignment was to "go shopping":

> Shop in your neighborhood in a mall. Everyone has an anchor store. Write two paragraphs about what you find. First, look at Armani or any brand you want. Look at how well it's bought. How it's merchandised. The fixtures. Exit the store and go to the best independent/specialty in that mall and see if a similar garment is being sold by the same designer or a knock off. How deep. Color mixture. Fixtures, etcetera. This assignment is non-graded. You're thinking. The point is not to get an A+ in shopping. Whatever phase of the industry you're in, you have to shop at least twice a week. I'm always going to different stores to look at different types of garments and fits.

Linkages and Educational Responsiveness to Industry

The fashion programs at L.A. Trade Tech are linked to the industry in a variety of ways. All of the instructors have come out of the industry and many continue to work in the industry on a part-time or freelance basis. Activity in professional associations is also strongly encouraged. The part-time staff comprises an additional conduit to industry, as the part-timers are all full-time employees or even proprietors of their own design or merchandising firms.

Institutionally, internships are one of the most important linkages that the programs maintain to industry. Internships are a crucial part of the merchandising program. "Work education is built into our program," explained the director of the merchandising program. Students pursuing the merchandising and personnel options are required to take four credits of cooperative education in their third semester. Internships are developed through the advisory committee (discussed below) and the strong linkages that the merchandising director has with the retail community. As the internships are closely monitored, with students required to report on their activities regularly, cooperative education becomes a means of starting students on their careers. "Many interns have moved up to become regular employees in a management capacity." By contrast, internships are not encouraged in design, where the "manufacturers would love to hire someone for no salary: They won't promote or mainstream them."

But the most important linkage to industry consists of separate advisory boards for the merchandising and design programs. Formally, the boards are relied on to monitor curriculum, assess its relevance, and help with placement. Though the boards meet once a year, the directors of the merchandising and design programs are in contact with their board members "a lot more often." One of the board members noted that "the school is very well connected. They're aware of the industry's needs." "I'm on the phone usually once a week," pointed out the director of the merchandising program. "This is a way of cross-recruitment. Personnel managers send students; they may have a sharp sales associate who doesn't have an AA. We get a lot of referrals this way."

An important example of the school's responsiveness to the industry's changing needs is its adoption of a course in computerized marking and grading. These functions, by which patterns are sized and laid out on a piece of textile to maximize cloth utilization, were computerized twenty years ago; as the costs of the equipment have diminished, the technology has diffused extensively, becoming practical even for small firms dependent on short production cycles such as are found in Los Angeles.

An unusual venture into customized training for employers allowed L.A. Trade Tech to bring this new technology onboard. The design program obtained a four-year, 1.5 million dollar grant from the state's Employment Training Program, which provides funds for retraining workers. This enabled the school to buy a Gerber marker/patternmaker and train 150 people from industry on this new technology. All of the persons participating in the program had to be working and their employers had to state that they were likely to be unemployed if not trained in the new technology. After four years of running the program on a customized basis, the school decided to discontinue this operation and mainstreamed the course instead. Subsequently, it succeeded in obtaining a donation from the computer manufacturer of 75,000 dollars worth of PC equipment to replace the mainframe with which the marker/patternmaker was originally equipped. Not only is the course in computerized marking and grading a component of the regular, daytime program, but it is also a very popular evening offering, attracting a large number of persons who are working full-time in the industry and are seeking to upgrade their skills.

Placement

The fashion programs have an active and successful placement program, which illustrates the strength of the school's ties with local employers. While "there is tremendous demand for our graduates," as the programs' former dean noted, placement is not simply a passive response to opportunities, but an active attempt to orient students toward careers while they are still engaged in full-time studies.

In design, students are encouraged to work part-time as samplemakers or sample cutters while enrolled in the program. Students obtain these jobs by connecting with industry in a variety of ways, including "industry shows where we go out and demonstrate our students' ability" or "field trips where students will see a place that they like and teachers follow-up with a call to the employer, inquiring whether the employer would like to see the student's portfolio."

These part-time jobs prepare graduates to move directly to the second step right after graduation, working as "first patternmaker, and from there into assistant design, and if very capable to larger firms, as production patternmaker or production manager." Sometimes part-time employment provides a direct springboard to post-graduate full-time employment. In other cases, students rely on the school, which maintains a constant job-call system, in which employers call with positions. In addition, individual teachers use their own connections to help place students.

In the merchandising program, one can think of placement activities as beginning with the mandatory careers course, in which speakers, many of them L.A. Trade Tech graduates, talk to students about the different positions in merchandising that they occupy.

After the first semester, as a recent graduate told me, "You focus in on what you really want. I spoke with a counselor and realized I was oriented toward people, journalism, PR."

Placement takes off from this base. The director of the merchandising program stated that

> I interview each merchandising student individually and try to place them according to their interests and experience. I call people, my contacts, people I know, or who have been on the advisory committee. Then I get calls from prior graduates.

Merchandising students start out in a variety of different areas, ranging from a recent graduate working as a personal shopper in a department store to another who has become a media coordinator for the Broadway (a large, regional chain). One recent graduate, who now works at the L.A. Apparel Mart described her trajectory from school to a career in fashion merchandising in the following way:

> I started at L.A. Trade Tech in 1987. I attended a symposium at the Mart and that was how I realized I was interested in PR. I networked with (the director of the merchandising program) quite often. She was instrumental in having me start at L.A. Mart through an internship. I started out as intern in 1988, did a lot of xeroxing and whatever they wanted. At the end of the interview, they said thanks, and then the next day they called and asked me to interview for a secretarial position. From there I was promoted to PR assistant, then we focused in on creating our own department, then I became retail relations coordinator, and now manager just last week.

Most graduates, however, go into merchandising. In this field, entry into the industry occurs on the selling floor, with the associate's degree having a positive, "credentialing" effect on Trade Tech graduates. As one personnel manager, a member of the school's advisory board, stated,

> Basically with most retailers, and with our store in particular, a lot of what we do is on-the-job-training. We would start someone on the selling floor, even with a degree, that's where it happens. The Trade Tech graduates would come in knowing they want to progress. Their training helps them get an understanding of what retailing is about. They're on a much faster track than someone off the street without that background. With the [L.A. Trade Tech] fashion people, the fact that they've been trained gives them an insight into the business end that is a real plus for us. They know that there is more than what appears to be a glamorous job amidst beautiful merchandise.

Occupational Orientation: The Sources of its Persistence

Though housed within the same institutional structure, the fashion design and merchandising programs run in separate and very distinct tracks. The study of L.A. Trade Tech is a story of high-quality programs, which have actually grown in numbers, scope, and sophistication, while maintaining a traditionally occupationally-oriented focus.

Of course, there is one important respect in which integration has already occurred. Instruction, as noted earlier, has a strong applied bent. Students are not just taught to enjoy the aesthetic appeal of fashion, but to appreciate its economic side as well. The instructor in the fashion communication course, for example, emphasized the tension between producing a beautiful press kit and avoiding a disaster on one's bottom line. Similarly, the patternmaking instructor repeatedly intermingled design and economic considerations. Thus, teaching at L.A. Trade Tech seeks an integration of technical and business knowledge. But it does so in a way that will give students an implicit, tacit knowledge of the industry, without necessarily understanding deeper, economic, or organizational principles.

There are also some tendencies toward integration at a course level that would impart this type of theoretical understanding. One of the design electives on fashion merchandising and costing parallels a course in the merchandising program. Similarly, merchandising students are all required to take at least four one-credit fashion design courses. Moreover, the programs' directors encourage stronger linkages between the programs. As the director of the merchandising program explained, "There is some crossover between design and merchandising: the design students realize that they don't have a business background. They don't know how to merchandise their own designs."

The programs' former dean noted that "the fashion analysis course teaches students more about how clothes look on the body. This would be very valuable for designers." At a practical level, integration can give students a better appreciation of the nitty-gritty nature of making and selling clothing:

> Sales is like the sample room. If we as designers and merchants have not been close to the sales floor, we don't know what we're doing. It gives you a real sense for what merchandise is. Understanding how to sell one *thing*. How to look at merchandise for what it is, not a beautiful Yves St. Laurent gown, but a thing, a piece of merchandise, a unit, that sells. Every person should have this experience.

For the design students, however, serious pursuit of business oriented skills is impeded by the technical requirements of the jobs for which they are being trained. As we have noted, the design program is extraordinarily time-intensive, with the great bulk of time being spent in labs where complicated, technical skills are being taught. Furthermore, the design requirements of these courses often involve substantial time investments above and beyond the hours spent in class.

Moreover, the benefits of greater concentration on design probably outweigh investment in merchandising education—at least in the short run. As we have noted, the design students are very marketable—indeed, so marketable that a substantial portion "job out" prior to completion of requirements for the certificate. Once they have obtained a certain competency in basic clothing skills—construction, grading, sketching—they are likely to gain greater immediate benefit from the further sophistication acquired in computer fashion sketching than in principles of selling, a merchandising course.

Success in many of the merchandising courses also depends on skills that a substantial portion of the design students lack. As we have noted, many are immigrants, lacking fluency in English, and often deficient in writing and basic mathematical skills. Whereas these inadequacies do not impede entry into good technical jobs in apparel manufacturing, they have a negative effect on prospects for a retail career. As one personnel manager explained,

> When I'm picking people for this store, they must be fluent and must understand [English]. If a person wants to go into management, I need to be convinced that language will not be a barrier and that their written and oral skills are up to par. .

Language and skill questions aside, design students have few incentives to obtain a more extensive merchandising education. Although there has been some integration between the retail and apparel sectors, the private label business, a prime example of such integration, is a small portion of total employment even in those retail chains that produce their privately labeled clothes. Moreover, the private label business is often located at corporate headquarters, which in the retail business is still much more likely to be New York than Los Angeles.

Finally, the returns to investment in education are likely to be more preferable in design than in merchandising. Design students move directly into technical positions as patternmakers or production managers. By contrast, merchandising students move into sales jobs, from which promotion certainly occurs, but obviously not in every case. Moreover, the pay differential argues for design, as patternmakers do better than department store salespeople.

A somewhat different set of considerations argues against investment in design education for merchandising students. The time-intensive demands of the design program virtually preclude taking more than a sampler of the merchandising curriculum. For example, an entry-level student would have to commit twenty hours to basic design courses, leaving very little time for instruction in merchandising. Even if the student were somehow able to spend thirty hours a week in class and handle all the homework, the return to the additional design education would be quite uncertain. As one retailer noted, "Having a design background is nice because you know construction and fit, but it doesn't greatly affect what you do on the selling floor."

Conclusion

Although many educators see the possible benefits of a more industry-oriented, as opposed to occupationally oriented, education, this case study of two outstanding but traditional programs highlights the obstacles to change. In this industry, at the very least, the demand for technical personnel with industry-wide knowledge is relatively weak. Clearly, on both retail and production sides, the industry wants higher skills, as educators at L.A. Trade Tech know full well. But the demand for higher skills translates into demand for higher *technical* skills, as in the case of the computerized program class that L.A. Trade Tech has developed. There is a strong demand among local apparel makers and merchandisers for the graduates of these apparel programs, but the industry is not clamoring for graduates who have a significantly broader knowledge of AAI. At least so far, local employers have not challenged the traditional categories and boundaries that shape the occupational structure of the industry. And in a city like Los Angeles, the patterns of ethnic employment tend to reinforce those traditional divisions.

On the supply side, the constraint is that L.A. Trade is a postsecondary institution serving older students who often have formidable technical skills to acquire. Completing the requirements for the design program is a considerable hurdle for even the most motivated student, who at age 25, 30, or 35, is understandably eager to begin work. A rigorous high school training in design or merchandising might help solve the problem, as the school could take some skill level for granted. But at the moment, fashion education at the high school level is very weak. And given the community college's open admission policies, it would be difficult to create separate tracks for those with formal high school fashion training and those without.

Thus, the case of L.A. Trade Tech suggests a pattern of educational innovation similar to the pattern we found in training for the direct production jobs in apparel and indeed in printing training as well. Educators and employers agree in principle that students could benefit from broader training and a firmer understanding of the contexts in which they will work and of the related functions and activities in their firms and industries. And this conviction is translated into tentative steps towards curriculum reform either through electives or through incorporation of broader material within specific courses. But this is still done very much within the traditional occupational framework.

Throughout this report we have emphasized two broad problems that thwart efforts to introduce a greater emphasis on AAI. The first is that this educational strategy threatens traditional categories and divisions. In the case of the Los Angeles apparel industry, employers apparently believe that these traditional categories still serve their purposes. They are also reinforced by the city's ethnic heterogeneity. The second problem is that while broader education may pay off in the long run, in the short run it appears to divert students or workers from learning skills or engaging in activities that are more immediately useful. This problem is particularly clear in the design program. Which of the needed technical skills should students forego in order to gain a stronger understanding of merchandising?

Finally, the incentives for curricular innovation at L.A. Trade Tech are not strong. Employers are not demanding a change in the instruction. On the contrary, the programs have strong enrollments and employers eagerly hire their graduates. In comparison to this evident success, the benefits of a significant reformulation of the curriculum seem far off and abstract.

Fashion Institute of Technology

The Fashion Institute of Technology (FIT) is the leading fashion-oriented educational institution in the country. FIT was founded in the 1940s as a two-year community college in which the "community" is defined as the fashion industry.[23] The FIT program is considered a model for other schools and indeed many have copied it explicitly. Although we did not conduct a full case study of FIT, we did conduct interviews with staff in the Fashion Buying and Merchandising and the Fashion Design Programs for the purpose of evaluating whether the situation at L.A. Trade Tech was representative.

The content and growth trends of the programs in the two schools share many similarities. In both cities, there is strong demand for places in the program. The merchandising program at FIT has five or six applicants for every place. In 1992, FIT had students from 37 states and 57 countries. And there is strong demand in the labor market for the design students from both schools. One difference is that the market for merchandising graduates in New York has contracted significantly in the last decade, primarily because of the mergers and bankruptcies that swept the New York retail sector.

The nature of the student body at FIT has also changed, reflecting the changing ethnic mix of the city's population. We also heard complaints about the inadequate basic skills of many of their students. As in Los Angeles, some students must be taught how to use a ruler. Many students can hardly express themselves and do not know how to write a term paper. There are an increasing number of foreign students with weak English.

There is an ongoing discussion at FIT concerning the breadth of the course offerings, and there is some effort to expose students to material outside of their major area. For example, for a merchandising degree, students take 26 liberal arts credits, 30 major areas credits (requirements and electives), and 8 to 109 points in related areas such as draping, textiles, or apparel design. According to the chairman of the merchandising program, "students need to know the difference between good and bad merchandise."

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[23] The information on FIT was gathered from interviews with Newton Godnick, Chairman of the Fashion Buying and Merchandising Department; Irwin Kahn, Professor of Manufacturing and Management; and Deborah Gioello, Chair of the Fashion Design Department.

As was the case at L.A. Trade Tech, the fashion design program, especially the two-year version, is highly structured. In every semester the students study sewing, patternmaking, draping, and art. Although students do get some chance to take electives, the emphasis is very much on teaching the specific skills.

In the two-year programs, curricular innovation takes place more within specific courses than through new courses. The chair of the design department emphasized that design students must learn something about production and costing: "They need to understand that they are not operating in a vacuum and that in many cases, they must alter their designs in order to come in under a given cost." In some cases, they learn about the machinery that is used to produce their designs. They also learn how to work with production and merchandising people. But this material is taught within the design courses. Similarly, a marketing course covers how manufacturers manage the product, and students in a course in production control discuss how to support the marketing needs.

There is much more opportunity to take a broader range of courses in the four-year programs. For example, in the four-year program for designers, students take a course each in merchandising and marketing, business, and business law. Indeed, frequently students can get an associate's degree in one area such as merchandising, and then end up with a minor concentration for the bachelor's degree in manufacturing.

The distinction between the two- and four-year program highlights the tradeoffs between preparation for specific skills and the breadth of the training. With more time, the programs can both devote adequate time to specific skills and offer courses outside of the areas of specialization. The chair of the merchandising department stated that they have increasing difficulty in placing the graduates of the two-year program. This at least suggests that for the types of jobs that are available in the uncertain New York retailing sector, employers do value the broader skills and knowledge acquired by the B.A. graduates. But there is no consensus at FIT on this issue.

And for the shorter programs as well, controversy continues. Some members of the staff believe that design and merchandising students must have more understanding of new methods of production, the principles of Quick Response, foreign markets, and foreign sourcing. But other professors argue that this is a luxury that the programs cannot afford. As a member of the design department asked, "Can we afford to teach these subjects when a student's basic design work is deficient when their portfolios are weak?" Moreover, a shift to a broader more theoretical approach is further complicated by the weaker basic skills of many of the incoming students. "Without good problem-solving skills, students are not able to make connections between the general and the specific that a more conceptual curriculum would require." Indeed, according to this professor, many students want to be told exactly what to do. They want to know *the* answer rather than underlying principles that would give them several routes to a set of possible answers to a given problem or question. Finally, the current success of the school and its international reputation are other factors that discourage significant change.

Thus, we can discern a generally similar pattern at FIT and L.A. Trade Tech. In both cases, there is discussion of reform that is to some extent translated into broader curricula within a traditional occupationally oriented course structure. A significant shift towards an AAI strategy is a long way off. The pressure to teach the basic technical skills is perhaps the most immediate barrier. The perceived success of the programs is another factor that weakens incentives to change. Certainly in Los Angeles, there is little indication that employers are demanding major educational innovations. The traditional occupational categories and educational approaches seem to continue to serve the Los Angeles industry.

But there appears to be more controversy within FIT about the content of the curriculum. The pressure to shift the emphasis of the four-year programs suggests that there is some demand for broader skills. But this difference may reflect the different economic environments in which the schools are located. The fashion sector in Los Angeles has experienced significant growth during the last decade, but while New York retains its place as the fashion capital of the U.S., its lead has shrunk, and New York production employment has shrunk steadily during the last few decades. More change and uncertainty may encourage more interest in innovation.

CONCLUSIONS AND RECOMMENDATIONS

The education reform discussion continues to evolve. During the 1980s, reformers focused first on increasing the teaching of traditional academic skills and later on strategies for educational restructuring such as site-based management. While the restructuring emphasis continues, reform discussion in the 1990s, and particularly since the beginning of the Clinton administration, has sought to bring about a wide range of changes in schools. These include combining learning and experience; integrating vocational and academic education; developing more interdisciplinary instruction; forging links among schools, businesses, and community institutions; avoiding narrow training; and preparing students for a variety of activities and a faster-changing environment.

Education for all aspects of the industry (AAI) is a strategy that seeks to achieve all of these objectives. Thus while AAI is a specific strategy defined in the Carl D. Perkins Vocational and Applied Technology Education Act of 1990, it is representative of the mainstream education reform initiatives of the 1990s.

There are three broad justifications for this approach to education. First, AAI is considered an effective pedagogic strategy for providing a broad range of knowledge and skills. Second, AAI is designed to prepare students for more heterogeneous and faster changing careers. And finally, some believe that changing skill requirements on the job are increasing the demand for recruits with AAI type training.

Since there are several factors encouraging the development of AAI education, it may be that it is still worth pursuing even if one or two of those factors are weak. Thus, even if the demand by employers for AAI-trained workers is not strong, the strategy may still be justified on the basis of its pedagogic benefits and its effect on the ability of students to manage faster-changing careers. On the other hand, growing interest on the part of employers will surely increase the chances that AAI will have political support and adequate access to resources.

We, therefore, have chosen to examine the AAI movement with particular attention to its relationship to the changing nature of work and resulting skill needs. By analyzing the emerging needs of specific industries and the educational responses to those needs within the industries themselves and in educational institutions that prepare workers for those industries, we have been able to develop a better understanding of the demands of AAI and the barriers that stand in its way.

Thus, we set out to answer four broad questions outlined in the introduction. In this conclusion we shall review those questions and summarize the answers obtained through our case studies.

1. How strong is the demand for AAI knowledge and skills in the workplace?

Both of the industries examined in this report have undergone and continue to experience major economic changes that appear to favor an AAI approach. Of course, there are significant differences between these two industries, and the forces encouraging change may be stronger in printing; nevertheless, apparel and printing employers both face frequent market shifts, rapid technological development, and new forms of relationships among and within firms. Indeed, employers and their trade associations emphasize the need for innovative organizational reform and associated broad training.

But despite support and enthusiasm for innovative organizational reform, adoption of new approaches to production has been slow, although there have been some notable exceptions. Thus, while many employers express an interest in workers with broader skills and knowledge, most workplaces continue to be organized in such a way that broader skills and knowledge are not essential. One strong indication of this was that AAI was not a central feature of much of the training offered by employers. For many employers, the advantages of work reorganization and broader training are outweighed by the short-term costs associated with this strategy.

We identified three broad barriers to the introduction of innovative work organization and the broader training that would accompany it. These were

1. concerns about the labor supply.
2. the short-term demands of day-to-day production.
3. the strength of traditional divisions and barriers that would be threatened by innovative work organization and associated AAI training.

2. To what extent is AAI reflected in the curricula and educational strategies of the schools and training programs that prepare students for the workplace?

The administrators and staff at each one of the educational institutions examined expressed interest in and commitment to broader training, but some of the institutions have made much more progress than others. In general, the short-term programs designed to prepare production workers for particular technologies or occupations are the least likely to have incorporated broader material in their curricula. The clearest examples of this are the programs at TC^2 and at El Paso Community College. Programs that need to teach a demanding set of technical skills such as the fashion design departments at L.A. Trade Tech and the Fashion Institute of Technology also have trouble including broader instruction into their curricula. The staff in these programs believe that their students could benefit from elements of an AAI approach and do require electives and attempt to incorporate a variety of materials in their core courses. Nevertheless, they have an acute sense of the tradeoffs that they would need to make to broaden their offerings. The merchandising programs are somewhat more amorphous and it is therefore easier to adjust the offerings. For the most part, however, education in the institutions that we studied is organized along traditional occupational lines and attempts to introduce an AAI-type approach are taking place around the edges.

Of the schools that we examined, the Don Bosco Technical Institute has perhaps made the most progress. There are several possible explanations, but an important factor is that the administration of the school has decided to sacrifice some short-term preparation to pursue a more general strategy. In this case, the tradeoffs may also be eased because most graduates eventually go on to higher level technical or managerial positions. Indeed, as the Rochester Institute of Technology (RIT) case suggests, an AAI approach is much more widely accepted for managerial education than it is for the preparation of production workers.

In conclusion, educators do express enthusiasm for AAI, even for production workers. But progress in developing broader curricula has been uneven and in most cases, remains firmly within a traditional occupational framework. More progress has been made in managerial education.

3. What are the barriers that stand in the way of wider development and diffusion of AAI strategies in schools?

Why have educators had difficulty implementing an educational strategy that enjoys such widespread support? Earlier, we outlined three broad problems that thwart organizational reform and the accompanying broader training in the workplace. We find that educators face essentially the same problems in moving towards an AAI approach.

The Educational Preparation of the Incoming Students

Just as firms often doubt the quality of their entry-level recruits, in many cases the schools that we studied complained about the skills of their entering students. Even postsecondary educators find that many students cannot use a ruler and are even less able to write a coherent essay. Growing immigrant populations in many large cities create parallel problems. AAI may in fact be an effective strategy for teaching basic skills even to students who have had problems with other pedagogic strategies. Nevertheless, educators who have tried to broaden their curricula complain that many students simply do not come in with the basic skills to handle a broader, more sophisticated, and more conceptual curriculum. From this perspective, the ability to select their student body is one reason why Don Bosco Technical Institute has been able to make more progress towards an AAI approach than many other institutions.

The Conflict Between Concrete Short-Term Needs and More Amorphous Benefits that Only Pay Off in the Long Run

Like employers, educators also face a tradeoff between short-term demands and the longer-term benefits of AAI. Educational planners have a strong sense of the tradeoffs necessary to teach broader skills. This is particularly true of programs such as those in fashion design in which there are demanding technical skills to be taught. The longer-term benefits of AAI education seem less significant when planners believe that they must eliminate the teaching of necessary skills in order to broaden the curriculum.

Employer demands clearly contribute to the tension between an AAI strategy and short-term needs. Indeed, some educators conceptualize their choice as an option to either follow or lead the local industry. They believe that a thorough AAI approach would prepare their graduates for jobs in the next decade, but not for many jobs available now. Thus, for example, many graphic arts employers still look for graduates with stripping and photographic skills that will be obsolete in a few years. The conflict is less acute for managers and higher level workers; thus, RIT and, to a large extent, the Don Bosco Technical Institute have more flexibility in their curricula because most of their students will end up in managerial positions. In the end, the slow acceptance of AAI-based work organizations sends educators signals that are at best conflicting; at worst, they suggest that industry is not concerned with broad-based skills or reorganized workplaces.

Traditional Categories and Divisions Threatened by AAI

Like innovating employers, schools and educational institutions also face barriers created by traditional categories and divisions that are threatened by AAI. The cases that we have described contain several examples. The union-management conflict that bedevils the GCIU training programs is one example. The GCIU model, which involves collective financial support for training by a group of employers, appears to offer a solution to many training problems, but the continuing conflict between the unions and employer associations has closed off this strategy as an approach to training innovation for this industry. Traditional academic organization and the associated turf battles also threaten the development of AAI. Finally, we have also seen examples in which traditional ethnic concentrations in particular occupations or programs make it more difficult to develop overarching educational strategies.

Conclusion

In the end, the farther an educational institution or program is from the actual process of production (or its equivalent in services), the easier it is to develop broader curricula. Thus, both educators and employers are more convinced about the need for broader education for managers who are not directly involved with production. But from a different point of view, this observation implies that AAI may be particularly suited for secondary schools. Graduates who have no more than a high school diploma are now unlikely to find employment other than in unskilled low paying jobs. Finding good jobs will require postsecondary training, so high schools will be increasingly insulated from the tradeoffs between broad training and the immediate needs of local employers.

This suggests that the pedagogic and career-preparation justifications for AAI remains the strongest. Indeed, the effect of employer demand on the spread of AAI is mixed. Models of more effective work organizations appear to work best with more broadly educated workers, but many employers continue to adhere to a more traditional approach to production. Those employers are more interested in traditional skills and in some cases even in skills that will soon be obsolete.

On the other hand, it is possible that if the workforce generally had broader skills, employers would move more quickly. Indeed, weak labor force skills are one of the reasons employers cite for their reluctance to adopt new strategies (Koppel, 1990). It would be unrealistic to expect that this alone would be the key to rapid spread of organizational reform. After all, labor supply problems are only one reason why employers cling to traditional means. Nevertheless, the possible encouragement to production innovation does offer a justification for pushing ahead with AAI in schools, despite lukewarm employer interest. This added to the possible pedagogic benefits, which do not depend on employer demand, offers strong grounds for support of AAI educational reform.

Nevertheless, it makes most sense to try to develop a reform strategy that integrates efforts to introduce AAI in schools and to encourage firms to shift to strategies that would create a stronger demand for graduates of programs that emphasize AAI. We turn to a discussion of policy in the next section.

4. What additional public policy and research can help educators and employers overcome the barriers to AAI?

We have identified the following three broad barriers to the development and spread of AAI. How can these be overcome?

The Educational Preparation of the Incoming Students

The weakness of students entering the programs that we examined highlights a broader educational problem, one that has led to a rapid expansion of remedial programs in community colleges and even four-year colleges designed to teach basic literacy and arithmetic skills to high school graduates. It is not surprising that sophisticated and often demanding educational innovations at the upper-secondary or postsecondary level must be built on a solid foundation of basic skills. On the other hand, if AAI can be shown to be an effective pedagogic strategy for junior high or early secondary school students, then an approach which emphasizes AAI as a basic approach to teaching may itself help prepare high school students for more employment-oriented AAI programs in later years.

The Conflict Between Concrete Short-Term Needs and More Amorphous Benefits that Only Pay Off in the Long Run

Both in workplaces and in schools, the benefits of AAI often appear to be luxuries in the context of the day-to-day demands of production and of the need to have students graduate with immediately useful skills. There are three broad approaches to solving this dilemma:

1. The first involves strengthening our understanding of the extent of the benefits of AAI. While many people believe that AAI is a useful approach, we have no sense of the magnitude of those benefits relative to the costs. The tradeoffs necessary to broaden a curriculum might appear more favorable if planners had a more concrete measure of the payoff. Thus, there needs to be a broad evaluation strategy that examines the effects of AAI on skills, future earnings, and career paths in relation to other educational reform proposals. A variety of approaches are available. Researchers might also work closely with employers to improve our understanding of the benefits to the firm of broader knowledge and skills.

2. Another means of confronting the tradeoffs involved with broadening curricula is to try to develop pedagogic techniques that simultaneously teach the necessary specific skills as well as broader knowledge. This is a fundamental goal of the integration of vocational and academic education. The integration approach does not involve teaching both traditional vocational and academic skills, but, rather, it involves a pedagogic approach that teaches both at the same time. Indeed, advocates of integration often reject the distinction. There is now a tremendous amount of research and activity about techniques for integrating vocational and academic education and AAI is one vehicle for achieving that integration. Thus, continuing progress on integration will also help overcome barriers to AAI.

   AAI is closest to the integration approach when it is used in high schools as a technique to teach academic skills. In that case, the practical material can be designed in such a way as to promote the learning of the academic skills. But once programs are designed to teach immediately usable skills, it becomes more difficult to avoid the conflict and the resulting compromises. Nevertheless, a great deal more thought needs to be given to designing pedagogic strategies that minimize the conflict and tradeoffs.

3. We have so far suggested that the conflict that arises between the amorphous long-term benefits of AAI and the short-term needs of teaching particular skills could be eased either through a better understanding of the benefits or through pedagogic techniques that allow both objectives to be achieved together. In the end, some tradeoff will probably be necessary. Educators are trying to accomplish more with AAI than they were with more traditional approaches and ultimately it is reasonable to expect that this will take more time. More time can be found either by starting earlier or going later.

   Starting an AAI approach earlier in high school (or perhaps middle school) fits well with a greater emphasis on the general pedagogic strengths of AAI. But if the strategy is designed to teach students material about specific industries in which they will work, this may appear to require students to make decisions earlier. In the U.S., any program that is believed to require early tracking is likely to run into serious political opposition. Educators will have to emphasize the general nature of the education and early or pre-high school AAI will have to use very general industrial categories such as "transportation" or "built environment."

Increasing the years of schooling to include more material is the other option, but this obviously takes more resources. Nevertheless, educators are certainly considering it. For example, the staff of the design program at FIT has discussed whether to de-emphasize their two-year programs and expand the four-year programs which would ease the acute conflict between specific skills and broader knowledge. This is not an obvious approach since the two-year graduates can get jobs. Indeed, at L.A. Trade Tech, the two-year students often have employment opportunities before they graduate. Once again we need a better understanding of the benefits of AAI in order to make decisions about expanding schooling time and resources of both the schools and the students.

Traditional Categories and Divisions Threatened by AAI

The strength of traditional divisions has, in several cases, thwarted the development of AAI. These are often difficult problems to solve. For example, the problems of the GCIU training programs involve the long-standing labor-management conflict in the printing industry. This is not about to be resolved soon. Sometimes organizational solutions are possible. For example, Don Bosco Technical Institute has been able to make progress because of its strong local leadership. But this is a political issue and consolidations usually generate tremendous opposition from those faculty who perceive that the change is not in their interests.

Educators and employers are most likely to be able to overcome these types of problems if the incentives are strong enough. If the benefits of AAI are clearly understood or if employers begin to strongly favor graduates of AAI-oriented programs, then schools will have a stronger reason to change. Some additional categorical subsidies or other financial assistance may also help break through traditional barriers.

Working with Employers

The perception that broader knowledge and skills are increasingly advantageous for the emerging characteristics of the workplace is one of the key justifications for the educational reform movement that has created the environment for the discussion of AAI. Yet we have seen that demand for workers with the types of skills learned in AAI programs is mixed. Even without a strong demand from employers, AAI may be justified on the basis of its pedagogic benefits or its positive effects on students' abilities to negotiate an increasingly fluid and uncertain labor market. Nevertheless, active interest on the part of employers would certainly be key to a sustainable development of the strategy. But the development of AAI may be caught in a vicious circle in which employers are not interested because their labor force is not appropriately trained, and schools have no incentive to implement AAI because they perceive no demand from employers. Given this joint problem, it makes sense to consider policy approaches based on coordinated activities of both employers and schools.

For both industries that we have studied, there are industry-oriented schools with close ties to local employers. These schools already have considerable experience working with employers; the public sector might encourage this effort by funding conferences explicitly designed to discuss the benefits of a broader curriculum and to make joint plans. In some cases, schools could offer training and technical assistance to local firms to help them develop more innovative organizational strategies. At the same time, progressive firms could work with schools to develop forward looking curricula and help educators decide what short-term material might be reduced in order to make room for broader information. Schools and employers might also work together to ease the short-term/

long-term conflict in AAI by incorporating more AAI material into the training that workers receive from their employers or from equipment vendors. In the end, though, the central point is that neither employers nor schools would necessarily look to the other to take the lead exclusively. The public sector could act as a catalyst to encourage schools and employers to work together to achieve goals that may have eluded either set of institutions working alone.[24]

In conclusion, despite the wide support for AAI on the part of both employers and educators, only limited progress has been made. This is perhaps not surprising given the serious barriers that confront educational innovators interested in AAI. At this point, to a large extent, many employers and educators who prepare students for work see AAI as a luxury that can be put off while urgent short-term needs are met. Even if both schools and workplaces would benefit from an expansion of AAI, those benefits may not accrue to either if one acts alone. Thus, without a conscious program of change, progress will be slow at best. This creates a clear case for a public policy program of research, demonstration, and financial and technical assistance to help determine the ultimate potential for the strategy and to increase the chances that it will live up to that potential.

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[24] A listing of the preceding recommendations is included in the Appendix.

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APPENDIX

For those interested in a separate listing of the proposal's recommendations, we list the following:

1. Rather than confront the circular question of which should come first—AAI in education or in industry—a third party could intervene in the interests of both. The public sector, for example, could act as a catalyst, encouraging schools and employers to work together to achieve overarching goals that may have eluded either set of institutions when working alone. Public sector involvement could be initiated through conferences or seminars explicitly designed to promote the benefits of a broader curriculum and to encourage the development of collective programs.

2. Similarly, schools could offer training and technical assistance to local firms to help them develop innovative organizational strategies and narrow the gap between strictly skills-oriented training and AAI-based education.

3. Progressive firms could work with schools to develop a more industry-wide curricula, helping educators decide what short-term material might be reduced to make room for broader information.

4. Schools and employers might work together to ease the short-term/long-term conflict in AAI by incorporating more AAI material into the training that workers receive from their employers or from equipment vendors.

5. Given the importance of vendors in these industries, schools could, likewise, work with vendors to create a more comprehensive training perspective amenable to the needs of both employers and educators.